

Mid-term evaluation report on INSPIRE implementation

Joint EEA-JRC report

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Contents

Acknowledgements	4
Executive summary	5
1 Introduction	7
1.1 Policy background	7
1.2 Reporting on the implementation of INSPIRE	7
2 Key elements of the INSPIRE Directive	10
2.1 INSPIRE principles	10
2.2 Requirements in the INSPIRE Directive	10
2.3 Implementing rules and technical guidelines.....	11
2.4 Implementing timeline.....	13
2.5 INSPIRE infrastructure components.....	15
3 Methodology deployed for the assessment	16
3.1 The three-yearly reports prepared by the Member States	16
3.2 Review of secondary sources	16
3.3 Independent study of the extent of implementation in Member States	17
3.4 Public consultation	17
4 State of implementation	18
4.1 Legal transposition of the directive	18
4.2 Coordination	19
4.3 Implementing rules	26
4.4 Use of the infrastructure	43
4.5 Estimated costs and benefits	45
4.6 Summary of state of implementation	54
5 Links to other environmental legislation and to environmental policies.....	58
5.1 Introduction	58
5.2 The environmental <i>acquis</i> and INSPIRE.....	58
5.3 Implementation progress in Member States with respect to environmental policies and INSPIRE	60
5.4 INSPIRE and reporting under the environmental <i>acquis</i>	62
5.5 Summary of links to other environmental legislation and to environmental policies.....	66
6 Links to other policies and activities.....	68
6.1 Reuse of public sector information.....	68
6.2 Galileo	69
6.3 Copernicus.....	69
6.4 Links to other, non-environmental EU policies and activities	71
6.5 Alignment of national policies and strategies with INSPIRE	73
6.6 Links to other activities.....	75
7 Results of the assessment	76
7.1 Synthesis of the state of implementation	76
7.2 Overall assessment	76
Acronyms	88
References	92

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Executive summary

The implementation of the INSPIRE Directive across the European Union (EU) has reached the halfway stage with generally positive outcomes. This mid-term evaluation report looks at the implementation of the directive and its relevance, and discusses any fine-tuning necessary to fully meet its initial objective of creating an infrastructure to share spatial data and services in Europe supporting environmental policies and policies that have an impact on the environment.

INSPIRE was founded on the basis of five issues that were identified as presenting obstacles to this objective: missing or incomplete spatial data, incomplete descriptions of spatial data, difficulty to combine different spatial data sets, inaccessibility of spatial data and various barriers to data sharing.

The first important conclusion of the mid-term evaluation is that a satisfactory evolution of these issues has taken place until now. But overall, at the halfway stage of the directive, the five initial problems that led to the creation of INSPIRE still exist to varying degrees and the overall goal of INSPIRE is still valid.

The five INSPIRE objectives were developed to tackle the issues detailed above, thus they aim to: document spatial data and services, establish more internet based services, facilitate access to spatial data by improving interoperability, arrange for public authorities to have better access to spatial data and services, and improve the structures and mechanisms for the coordination of spatial information. A recent public consultation carried out by the European Commission found that some 92.5 % of responders still consider these objectives relevant.

This mid-term evaluation found that three of these objectives have undergone a positive evolution. Documentation has improved considerably through the increased availability of metadata, although accessing and reusing data remains a barrier. Considerable progress has been made on establishing internet based services but implementation is still insufficient. In addition,

interoperability is improving despite the fact that the majority of spatial data under Annexes II and III of INSPIRE are yet to be provided in conformity with the Implementing Rules until 2020.

Progress on the remaining two objectives has been less marked. The data and services policy objective, where barriers to sharing continue to exist, and the coordination objective, which is not well balanced, would benefit from a review.

The INSPIRE actions address the five main problems and the overall conclusion of the mid-term evaluation is that they are still very appropriate to the overall goal of INSPIRE. The actions aim to: create metadata, establish network services, ensure interoperability of spatial data sets and services, facilitate data and service sharing, and establish organisational structures and coordinate implementation. Only two of the actions are on track: the creation of metadata and the establishment of network services. The interoperability of spatial data sets also shows progress within the deadlines set by the Implementing Rules.

Elsewhere, it is clear that adjustments are needed. Most of the measures to ensure interoperability have yet to be implemented and the outcome of the public consultation indicates that this strand of INSPIRE is considered to be highly technically complex and requires more support. Additionally, some steps have been taken to overcome policy, organisational, legal and cultural barriers amongst participating countries, though much still needs to be done. Finally, the coordination action requires strengthening at EU, national and local level and across borders.

Overall, it can be concluded that there has been a generally positive evolution in the problems addressed by INSPIRE and the objectives and actions designed to solve them. This evolution has been facilitated by broader social and technical developments, including the wider availability of high-resolution imagery (in particular with the Copernicus EU Earth Observation programme entering into full operation and the Group on Earth

Observation/Global Earth Observation System of Systems initiative) and the adoption of open data policies across Europe. Encouragingly, this mid-term evaluation found that the INSPIRE Directive played a major role in contributing to this positive evolution, although it is not the only player.

The timing of this evaluation precludes an in-depth cost-benefit analysis. INSPIRE implementation is at the mid-point and many costs have not been incurred, for example those due to the interoperability of spatial data. The evaluation, therefore, only refers to costs incurred for the creation of metadata, the establishment of network services and some initial work on interoperability, all of which are generally in line with expectations.

These costs are offset by benefits from data discovery, documentation and availability, and it is expected that such benefits will outweigh the costs in the long run. Moreover, the INSPIRE objective of supporting environmental policies is addressed in a step-wise manner through an increasing integration into the environmental *acquis*. However, any investigation into costs should consider that, in many European countries, INSPIRE implementation has taken place in the context of the most testing financial circumstances.

With regards to the implementation of INSPIRE across the EU, evidence presented in the evaluation shows that, for many measures, it is inconsistent. For example, the transposition of INSPIRE into national law is not uniform across countries, nor is the work on establishing network services, and coordination and data sharing. However, the processes put in place by INSPIRE are delivering organisational change, so future efforts need to focus on how best to support those countries that are lagging behind with their implementation of the directive.

The main obstacles to the implementation of INSPIRE that emerge from the evaluation are the general technical complexity and the communication and coordination of the implementation of the directive. Possible measures suggested to adjust the objectives and actions in view of these issues could include a reduction in the administrative burden through simplified data sharing, awareness raising, capacity building and training for those public sector officials involved and ongoing improvements in coordination and communication amongst and between different countries. In addition, the private sector should be encouraged to participate more. These follow-up actions are addressed in the report.

1 Introduction

1.1 Policy background

A significant part of all information used by public authorities and exchanged with the public refers to specific locations. Its quality depends on the availability of 'spatial data' collected and linked (geo-referenced) to location, and then processed to derive the information. Most environmental data, such as emission measurements, biodiversity observations or environmental quality data are of a spatial nature.

Policy-relevant information is often based on a combination of different types of environmental and geographical data such as land use, administrative boundaries, elevation, hydrology and transport network data, production facilities and protected sites. Geophysical data on meteorology, geology, soils and so on are also relevant in the environmental policy context, as well as socio-economic data such as population density, and land and property data.

The programmes and measures laid down in thematic environmental legislation and policies having an impact on the environment (such as agriculture, transport and spatial development) generally entail the mitigation of risks arising from societal pressures on the environment or those related to natural or man-made hazards potentially leading to disasters (with climate change a driving factor).

For example, data on air quality and meteorological conditions, combined with data on transport, the location of industrial, urban and agricultural sources of emission, population and epidemiology, are needed to assess the health impacts of air pollution. Such data allow the identification of sources of pollution and the calibration of emission reductions targets in policies that have an impact on air quality.

Between 2001 and 2004, extensive fact finding and public consultations were undertaken to prepare

Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (hereafter referred to as the INSPIRE Directive). This work of fact-finding and public consultations identified a number of important obstacles preventing the widespread use of spatial data needed for environmental policies and policies to have an impact on the environment. For example, 97 % of the participants in a public consultation ⁽¹⁾ agreed that at all levels, from local to European:

1. spatial data are often missing or incomplete;
2. the description (documentation) of available spatial data is often incomplete;
3. spatial data sets can often not be combined with other spatial data sets;
4. the systems to find, access and use spatial data often function in isolation only and are not compatible with each other;
5. cultural, institutional, financial and legal barriers prevent or delay the sharing and reuse of existing spatial data.

The INSPIRE Directive was adopted in 2007 to address these issues and create an infrastructure to share spatial data and services in Europe supporting environmental policies or policies that have an impact on the environment. This report provides a mid-term evaluation of its implementation.

1.2 Reporting on the implementation of INSPIRE

According to Art. 23 of the INSPIRE Directive, the Commission has to present by 15 May 2014 and every six years thereafter a report on the

⁽¹⁾ Report on the feedback of the Internet consultation on a forthcoming EU initiative establishing a framework for the creation of an Infrastructure for Spatial Information in Europe, 28 August 2003 (http://inspire.ec.europa.eu/reports/analysis_consultation_01092003.pdf).

implementation of INSPIRE to the European Parliament and to the Council. This report has to be based, inter alia, on reports from the Member States.

According to the Communication 'Focus on results: Strengthening evaluation of Commission activities' (SEC(2000) 1051)⁽²⁾, such a report on the implementation of INSPIRE should reflect the findings of a formal policy evaluation. The purpose of a 'policy evaluation' is to judge the results and impacts of legislation/regulation against the desired effect of implementation and covering all types of interventions/actions in a broad sense.

There are different types of policy evaluations (ex ante, interim, ex post, ad hoc). Given the status of implementation of INSPIRE, the purpose of this policy evaluation is to obtain an interim assessment.

An interim policy evaluation assesses whether the actions already underway are still on course to meet their objectives. It should provide an opinion on the relevance, consistency, economy, efficiency, effectiveness, added value and sustainability of the INSPIRE policy actions, evaluated in the light of their objectives and the status of their implementation. It aims to arrive at a judgement as to remedial action that might be necessary to adapt current approaches so that they align better — in the light of a changing environment — with the achievement of the original objectives of INSPIRE and its implementing rules (IRs).

The general objectives of the INSPIRE interim policy evaluation are therefore:

- to assess whether the objectives of INSPIRE continue to be relevant vis-à-vis the problems addressed;
- to measure delivery of initial outputs, early effects, cost effectiveness and efficiency of INSPIRE;
- to verify that resources invested have been converted into tangible and proportionate results that contribute to achieving the objectives of INSPIRE.

To this end, general evaluation questions should encompass a number of key (generic) issues:

- relevance (are the objectives of INSPIRE still pertinent to the needs?);

- coherence (is INSPIRE not contradicting other initiatives with similar objectives?);
- economy (are resources available?);
- effectiveness (to what extent have objectives been achieved?);
- efficiency (are the objectives achieved at reasonable costs?);
- sustainability (will positive actions from INSPIRE have a lasting effect?);
- utility (do the effects of INSPIRE respond to concrete needs?);
- consistency (are there positive/negative spillover effects of INSPIRE in other environmental, social and economic policy areas?);
- acceptability (what is the extent to which stakeholders accept/welcome/approve/disapprove the policy and its different instruments?).

Issues like coherence, utility and sustainability are less relevant for an interim policy evaluation. However, already at the interim stage of INSPIRE, certain effects may be noticeable. The policy evaluation report on the implementation of INSPIRE addresses therefore the following general evaluation questions:

1. Have the initial problems that INSPIRE intended to address evolved and in what way?
2. Are the objectives of INSPIRE still relevant to the problem? Do they need to be reviewed?
3. Are the actions of INSPIRE still appropriate or do they need to be modified?
4. Are changes (positive and negative) from the initial situation attributable to the implementation of INSPIRE?
5. Are results achieved so far commensurate with the means put forward and in line with the ones expected from the ex ante evaluation of INSPIRE?
6. Is the geographical coverage of implementation consistent?

⁽²⁾ Communication on evaluation of 26 July 2000 (SEC(2000) 1051) and the Communication on the implementation of activity-based management (ABM) of 25 July 2001 (SEC(2001) 1197/6&7).

In addition, the reporting on implementation of INSPIRE should take into account the Communication on the Regulatory Fitness and Performance Programme (REFIT) on evaluating and reducing administrative burden (COM(2012) 746 final). REFIT will identify burdens, inconsistencies, gaps and ineffective measures. Attention will be paid to possible regulatory burdens related to how EU legislation is implemented at the national and sub-national levels. Communication (COM(2013) 685 final) from 2 October 2013 (REFIT), in which the Commission set out the modalities for a comprehensive review of the legislation, includes the INSPIRE Directive as one of the pieces of legislation for a REFIT check. In addition, a number of additional general evaluation questions will be addressed:

1. What kind of administrative burden and costs for public authorities and other public users (enterprises including small and medium-sized enterprises (SMEs), private citizens, etc.) have been identified?
2. How can burdens and costs related to the users best be minimised or eliminated?
3. What would be the estimated value of saved administrative costs for public authorities and other public users?
4. Which gaps or inconsistency in the measures and working methods of INSPIRE have been identified?
5. How can the INSPIRE Directive and implementing rules be modernised and made less bureaucratic for the users?
6. What could make INSPIRE give even more value for money to the users?
7. What is the EU added value of INSPIRE in comparison to Member States' activities?

As a contribution to the policy evaluation, this report is organised as follows: Chapter 2 provides an overview of the key elements of INSPIRE and the timeline for its implementation; Chapter 3 explains the range of methods used for the assessment, while Chapter 4 is the core of the report providing a state-of-play assessment of the implementation of all the measures envisaged by INSPIRE and its implementing rules; Chapters 5 and 6 discuss the relationships between INSPIRE and environmental policies, and policies that affect the environment, respectively; and Chapter 7 draws these threads together and provides the overall assessment answering each of the 13 questions above.

2 Key elements of the INSPIRE Directive

The INSPIRE Directive lays down the general rules establishing the infrastructure for spatial information in the European Community in support of Community environmental policies and policies or activities that may have an impact on the environment (Art. 1(1)).

This chapter outlines the main principles of INSPIRE (Section 2.1), the requirements already specified in the INSPIRE Directive on data and service sharing between public authorities and with the public (Section 2.2), the INSPIRE implementing rules and technical guidelines (Section 2.3), the roadmap for implementation (Section 2.4) and the central INSPIRE infrastructure components (Section 2.5).

2.1 INSPIRE principles

INSPIRE should be based on the infrastructures for spatial information that are created by the Member States (Recital 5, Art. 1(2)). These infrastructures should ensure that:

- spatial data are stored, made available and maintained at the most appropriate level;
- it is possible to combine spatial data from different sources across the EU in a consistent way and share them between several users and applications;
- it is possible for spatial data collected at one level of public authority to be shared between other public authorities;
- spatial data are made available under conditions that do not unduly restrict their extensive use;
- it is easy to discover available spatial data, to evaluate their suitability for the purpose and to know the conditions applicable to their use (Recital 6).

It is important to remember that the INSPIRE Directive does not set requirements for the collection

of new data, or for reporting such information to the Commission (Recital 13, Art. 4(4)), since those matters are regulated by other legislation related to the environment.

2.2 Requirements in the INSPIRE Directive

2.2.1 Data and service sharing

The INSPIRE Directive lays down a number of rights and obligations regarding the sharing of spatial data sets and services between all levels of government (public authorities).

According to Art. 4(1), the arrangements apply to all spatial data sets that relate to one or more of the 34 data themes listed in the INSPIRE Annexes I to III, are in electronic format, and refer to an area where a Member State has and/or exercises jurisdictional rights. The arrangements apply to public authorities and/or entities/organisations managing or requiring the spatial data or services on their behalf.

Article 17 of the INSPIRE Directive defines the data sharing requirements in more detail. It requires Member States to adopt measures for the sharing of spatial data sets and services that enable its public authorities to gain access to these spatial data sets and services, and to exchange and use those data sets and services for the purposes of public tasks that may have an impact on the environment. The measures should preclude any restrictions likely to create practical obstacles to the sharing that might occur at the point of use. Hence, procedures regarding, for example, property rights, licensing and charging must be fully compatible with the general aim of facilitating the sharing of spatial data sets and services between public authorities.

In particular, the data sets and services provided by Member States to Community institutions and bodies in order to fulfil their reporting obligations under Community legislation relating to the environment shall not be subject to any charging.

Furthermore, the arrangements applied within a Member State also need to be open to public authorities of other Member States and to Community institutions and bodies, but they may be accompanied with requirements under their national law conditioning their use.

The data sharing requirements apply to all levels of public authority, operating at the lowest level of government provided there are laws or regulations requiring their collection or dissemination (Art. 4(6)). This means, for example, that this 'sharing obligation' covers all the data that are within the scope of the INSPIRE Directive and that are collected by monitoring programmes needed to meet regulatory obligations set by EU environmental policy and/or policies or activities (e.g. transport, spatial planning) that may have an impact on the environment. This should be reflected in the arrangements made at the Member State level.

Beyond the data sharing obligations between public authorities described above, the INSPIRE Directive, in Art. 11(1), also requires that the services that enable users to discover, view, download, transform and invoke spatial data are made available to the 'public' and are easy to use. In Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC⁽³⁾ (hereafter referred to as the Directive on Public Access to Environmental Information), the public is defined as 'one or more natural or legal persons, and, in accordance with national legislation or practice, their associations, organisations or groups'.

These obligations for public access differ, however, from the data sharing obligations between public authorities on a number of important points:

- Member States may derogate from granting 'public access', in a number of circumstances. These possible derogations correspond to those laid down in the Directive on Public Access to Environmental Information. For the INSPIRE 'sharing between public authorities' however, Member States may only derogate/limit sharing when this would compromise the course of justice, public security, national defence or international relations.
- Other points refer to charging for certain services under specific conditions, whereas for the

'sharing between public authorities' any such charges or licensing conditions must be fully compatible with the general aim of facilitating the sharing and do not apply to data covered by 'reporting' obligations to EU institutions and bodies.

2.2.2 INSPIRE coordination

The INSPIRE Directive also requires Member States to designate structures and mechanisms for coordinating, across the different levels of government, the contributions of all those with an interest in their infrastructures for spatial information. This could include users, producers, added value service providers and coordinating bodies (Art. 18). Such contributions could concern the identification of relevant data sets, user needs, the provision of information on existing practices and the provision of feedback on the implementation of this directive.

At the EU level, INSPIRE is coordinated by the Commission, assisted by relevant organisations and, in particular, by the European Environment Agency (EEA). Each Member State should designate a contact point, usually a public authority, to be responsible for contacts with the Commission in relation to INSPIRE. This National Contact Point (NCP) is to be supported by a coordination structure, taking account of the distribution of powers and responsibilities within the Member State.

2.3 Implementing rules and technical guidelines

The INSPIRE Directive requires common implementing rules to make the Member States' infrastructures compatible. These implementing rules should be supplemented with measures at the Community level (see Section 2.5), ensuring that the infrastructures for spatial information created by the Member States are compatible and usable in a Community and trans-boundary context (Recital 5).

The INSPIRE implementing rules address the following specific issues:

- The metadata (MD) implementing rules⁽⁴⁾ specify a number of common metadata elements to be provided for all resources (spatial data

⁽³⁾ See <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31990L0313:EN:HTML>.

⁽⁴⁾ Commission Regulation (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata, OJ L 326, 04/12/2008, pp. 12–30.

sets and services) within the scope of INSPIRE to facilitate their discovery within the INSPIRE infrastructure.

- The network services (NSs) implementing rules ⁽⁵⁾ specify common interfaces for web services for discovering, viewing, downloading and transforming spatial data sets. Based on these common interfaces, generic client applications can be developed that allow users to search for INSPIRE data sets, to download them or to view them in interactive maps.
- The interoperability of spatial data sets and services (ISDSSs) implementing rules ⁽⁶⁾ specify common data models, code lists, map layers and additional metadata (for evaluation and use) to be used when exchanging spatial data sets. These implementing rules provide the semantic interoperability layer and ensure that users of data can unambiguously interpret the data they are accessing through the network services.
- The data and service sharing (DSS) implementing rules ⁽⁷⁾ define the conditions under which Member States shall provide the institutions and bodies of the Union with access to spatial data sets and services in accordance with harmonised conditions.
- The monitoring and reporting (M&R) implementing rules ⁽⁸⁾ specify the rules on monitoring by Member States of the implementation and use of their infrastructures for spatial information and on reporting on the implementation of the INSPIRE Directive.

By March 2014, all implementing rules (with the exception of the implementing rules on the spatial data services which are still pending) had been adopted as Commission Decisions or Regulations, and are binding in their entirety. Implementing rules are adopted through the 'Comitology' procedure, where the Commission is assisted by a regulatory committee composed of representatives of the Member States and chaired by a representative of the Commission.

The implementing rules are complemented with technical guidelines (TGs) containing detailed instructions and recommendations for implementers. While implementing rules specify what needs to be implemented at an abstract and generic level, the non-binding technical guidelines specify how legal obligations (see Figure 2.1) could be implemented, making reference to existing standards where appropriate — e.g. those of the Open Geospatial Consortium (OGC) and ISO/TC211. Implementing these technical guidelines will maximise the interoperability of INSPIRE spatial data sets and services as well as guarantee interoperability with other sectors (through the reference to standards).

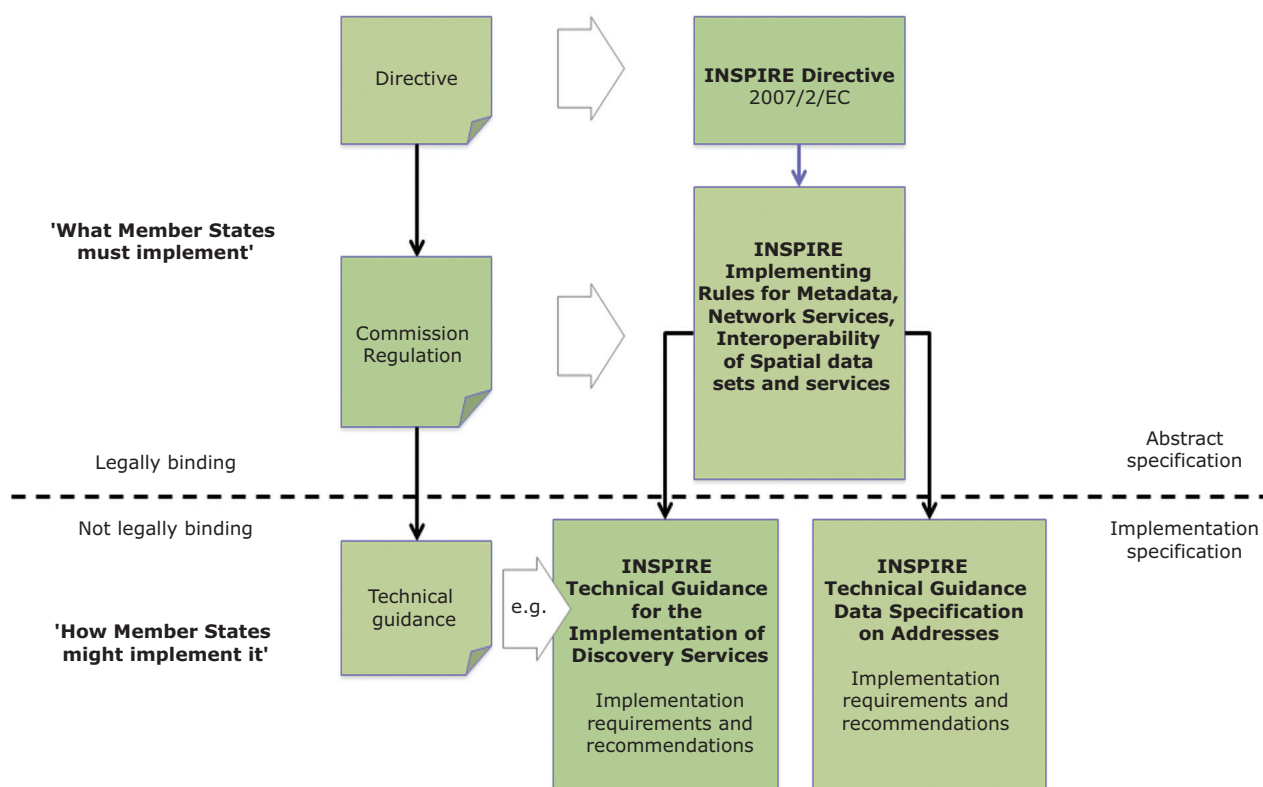
Both implementing rules and technical guidelines have been developed in close cooperation with the INSPIRE stakeholders, who were invited to propose experts for the Drafting Teams (DTs) and Thematic Working Groups (TWGs) supporting the development of the implementing rules and technical guidelines, proposing reference material for their development, and providing comments on the various drafts. This cooperation has been very successful, with several hundred experts, paid by their own organisations, involved in this major exercise in public participation, with more than 15 000 comments received during the several rounds of consultation.

⁽⁵⁾ Commission Regulation (EC) No 976/2009 of 19 October 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the Network Services, OJ L 274, 20/10/2009, pp. 9–18.

⁽⁶⁾ Commission Regulation (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services, OJ L 323, 08/12/2010, pp. 11–102.

⁽⁷⁾ Commission Regulation (EU) No 268/2010 of 29 March 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the access to spatial data sets and services of the Member States by Community institutions and bodies under harmonised conditions, OJ L 83, 30/03/2010, pp. 8–9.

⁽⁸⁾ Commission Decision of 5 June 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards monitoring and reporting (notified under document number C(2009) 4199) (Text with EEA relevance) (2009/442/EC).

Figure 2.1 Relationship between INSPIRE implementing rules and technical guidelines

2.4 Implementing timeline

The INSPIRE Directive envisages the implementation of the national infrastructures to be progressive and assigns different levels of priority to the INSPIRE spatial data themes. This is reflected in grouping the themes in the three annexes of the directive (Recital 14) and allowing different implementation timelines for the different annexes:

- **Metadata:** two years after implementing rule adoption for Annexes I and II (3 December 2010) and five years after implementing rule adoption for Annex III (3 December 2013).
- **Network services:** two years after adoption of the relevant implementing rules (9 November 2011 for discovery and view services, and 28 December 2012 for download and transformation services), but only for those spatial data sets and services for which metadata have been created in accordance with the directive (this delays the implementation deadline for network services for Annex III data sets to 3 December 2013).
- **Interoperability of spatial data sets and services:** two years after adoption of the relevant implementing rules for newly created or extensively restructured data sets ⁽⁹⁾ (23 November 2012 for Annex I, and 21 October 2015 for Annexes II and III data sets), and seven years after adoption of the relevant implementing rules for all other data sets (23 November 2017 and 21 October 2020).
- **Data and service sharing with Community institutions and bodies:** 18 months after entry into force (19 October 2011) with a transition period of up to 3 years for arrangements already in place at the time of entry into force of the implementing rule.
- **Monitoring and reporting:** after the date of adoption (5 June 2009), in practice since the first report after that (15 May 2010).

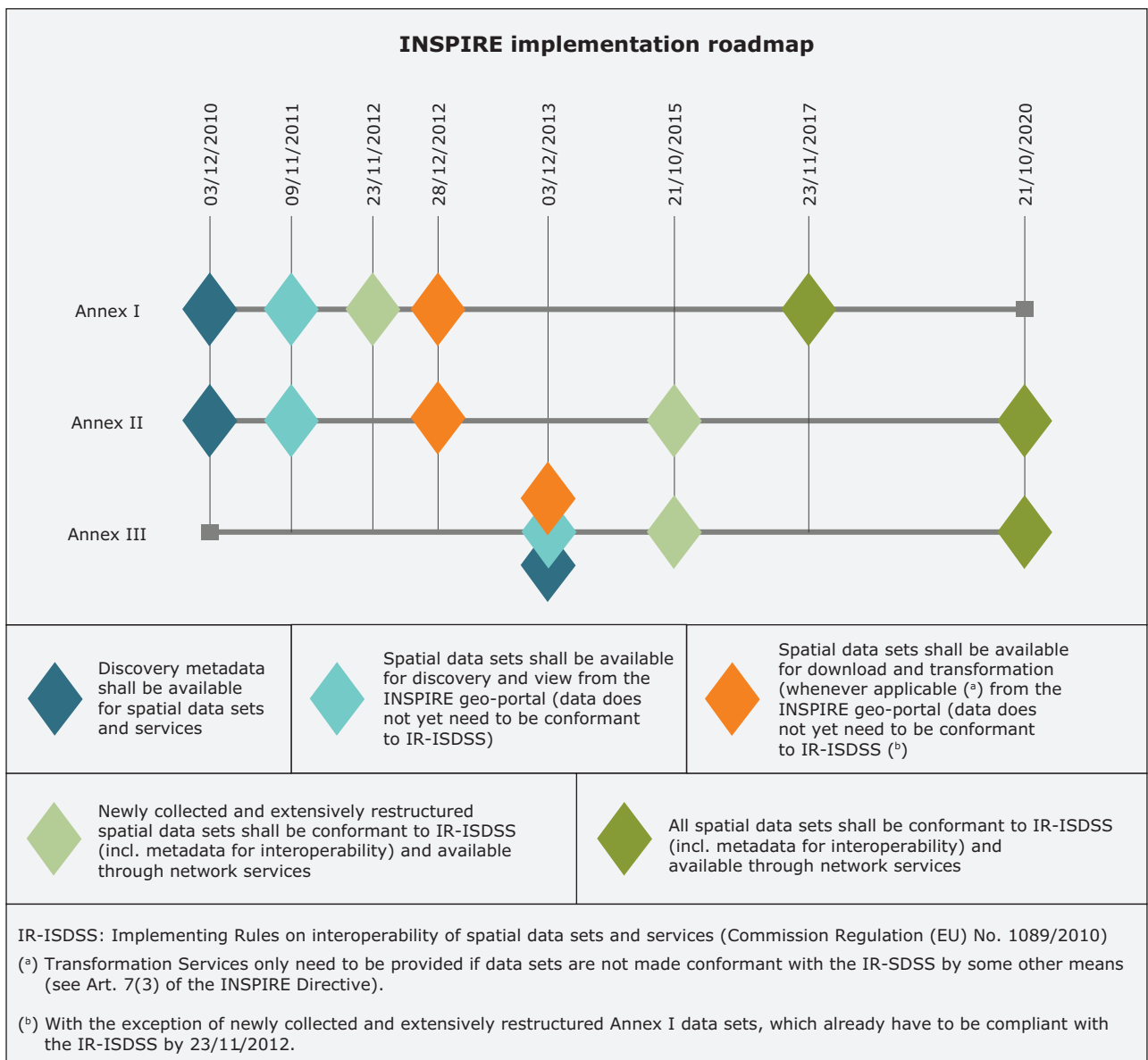
⁽⁹⁾ All spatial data sets that have been collected or extensively restructured after the entry into force of the INSPIRE Directive on 15 May 2007.

In addition, the legal obligations from the INSPIRE Directive (including obligations on data sharing among public authorities in Art. 17) apply since 15 May 2009, the deadline for Member States to transpose the directive into national law. This leads to a complex implementation roadmap, part of which is depicted in Figure 2.2 (the full roadmap is available at the following online address: <http://inspire.ec.europa.eu/index.cfm/pageid/44>).

In summary, at the time of writing, the Member States are expected to have already:

1. transposed the INSPIRE Directive into their national legislation and established appropriate structures and mechanisms for coordinating, across the different levels of government, the contributions of all those with an interest in their infrastructures for spatial information;
2. established measures for the 'sharing' (gaining access, exchange and use) of the spatial data and services between its public authorities, with equal arrangements open to the public authorities of other Member States;

Figure 2.2 Overview of the INSPIRE implementation roadmap for metadata, network services, and interoperability of spatial data sets and services



3. established measures for sharing with Community institutions and bodies, unless a transition period was requested;
4. documented all the data sets and services that fall under the 34 themes of INSPIRE with harmonised metadata;
5. provided easy-to-use discovery, view, download and transformation services (where needed);
6. provided newly collected or restructured data under Annex I according to the harmonised INSPIRE specification.

Note: It is the prerogative of the Member States to decide to whom their arrangements are applicable or how the data sets are managed (centralised, decentralised). What matters from an INSPIRE point of view is that at least the 'reference data sets', covering the available spatial data in Member States falling under the INSPIRE scope, are 'shared'.

However, it is important to note that many of the implementation deadlines have only recently passed (e.g. download services for Annexes I and II data sets in late 2012, metadata and all network services for Annex III in late 2013) and others are yet to come (data interoperability for all data sets except newly

collected/extensively restructured Annex I data sets). This means that much of the implementation of INSPIRE is only just starting in many organisations, which is an important factor to be considered in this mid-term evaluation.

2.5 INSPIRE infrastructure components

The directive requires that the implementing rules be supplemented with measures at Community level that should ensure that the infrastructures for spatial information created by the Member States are compatible and usable in a Community and trans-boundary context (Recital 5). One of these measures is the INSPIRE geo-portal developed and operated by the Commission (see Section 4.3.3), through which Member States should provide access to their infrastructures (Recital 20, Art. 15).

Another such measure, which is not explicitly mentioned in the directive, is an EU-level INSPIRE registry, which provides a system for the management of unique identifiers for resources used in the INSPIRE infrastructure (e.g. concepts, code lists, themes), and that can be connected to registries at the national level. A central registry is being developed by the European Commission Joint Research Centre (JRC). Formal feedback is being provided by stakeholders since early 2014.

3 Methodology deployed for the assessment

This report is based on multiple sources of information and methodologies, including:

1. the three-yearly reports prepared by the Member States;
2. a review of secondary sources (studies, reports, presentations at conferences);
3. an independent study of the extent of implementation in the Member States;
4. a public consultation.

3.1 The three-yearly reports prepared by the Member States

These are the primary source of information for the evaluation as required by the Directive (Art. 23). Specifically, Articles 21(2) and 21(3) require that Member States produce every three years reports with summary descriptions of:

- how public sector providers and users of spatial data sets and services and intermediary bodies are coordinated, and of the relationship with the third parties and of the organisation of quality assurance;
- the contribution made by public authorities or third parties to the functioning and coordination of the infrastructure for spatial information;
- information on the use of the infrastructure for spatial information;
- data sharing agreements between public authorities;
- the costs and benefits of implementing this directive.

As the directive was adopted in 2007 there have been two sets of reports submitted by the Member States: in 2010 and 2013. These reports are published on the INSPIRE website ⁽¹⁰⁾.

The quality of these reports has improved between the first and second editions, particularly for the section on costs and benefits of implementing the directive, following a workshop with the Member States in October 2012 and improved guidelines that followed. Nevertheless, the reports vary in quality with some being very thorough and detailed, and others providing considerably less information. As a general remark, these reports focus on the implementation of the technical infrastructure and do not yet consider the contribution of INSPIRE to improve the implementation of environmental policies or policies that affect the environment, which is the main role the infrastructure should have. Hopefully, as the process of data harmonisation takes place, there will be a more documented impact of INSPIRE on the implementation of environmental policies, as discussed in Section 7.2.11.

3.2 Review of secondary sources

A major information and data resource is the INSPIRE library maintained as part of the INSPIRE website ⁽¹¹⁾. It includes key reports such as the orientation and position papers prepared by the expert panels on which the 2004 Commission proposal for a directive was based, and the ex ante impact assessment of the Commission proposal. In addition, there are the documents and reports of a public consultation and public hearing event.

Negotiations on the Commission proposal for a directive started in 2004 and ended in December 2006 with a political agreement between the Council and Parliament. To support the negotiations,

⁽¹⁰⁾ <http://inspire.ec.europa.eu/index.cfm/pageid/182>.

⁽¹¹⁾ See <http://inspire.jrc.ec.europa.eu/index.cfm/pageid/6>.

INSPIRE state-of-play studies for each EU country were undertaken starting in 2004, and continued through the INSPIRE transposition (2007–2009) and implementation phase (2010) ⁽¹²⁾.

INSPIRE Art. 21(1) requires Member States to monitor the implementation and use of their infrastructures for spatial information and to make the results of this monitoring accessible to the Commission and to the public on a permanent basis. The modalities for such monitoring and reporting were laid down in Commission Decision 2009/442/EC of 5 June 2009 implementing the INSPIRE Directive. The INSPIRE website provides access to the yearly monitoring results and the three-yearly reports discussed in Section 3.1.

As part of the fact-finding leading to the INSPIRE proposal for a directive, the Commission has organised since 2002 European Spatial Data Infrastructure (ESDI) conferences and since 2007 INSPIRE conferences. The INSPIRE website provides access to all the material presented by the Commission and stakeholders at these conferences, including efforts and achievements in various thematic and geographical areas and the outcome of research or interregional projects, often with EU funding, related to INSPIRE.

According to INSPIRE Art. 15, Member States must provide access to the INSPIRE services through an EU portal established by the Commission. The data coming from the INSPIRE geo-portal ⁽¹³⁾ represents more useful input to the evaluation as it shows which data sets and services are made available by the Member States (see Section 4.3.3).

3.3 Independent study of the extent of implementation in Member States

An independent study was commissioned by the JRC in 2013 with the purpose of assessing the extent of implementation of INSPIRE by Member States. The study analysed for a sample of data sets and

services reported by the Member States in their monitoring tables whether they are documented and accessible from the INSPIRE geo-portal. It also visited the geoportals of Member States to identify data sets that should be reported and made accessible through the INSPIRE infrastructure but are not. The report of this independent study is an important component of this mid-term evaluation. The summary report of this study is available from the INSPIRE website ⁽¹⁴⁾.

3.4 Public consultation

In addition to the sources reported above, the European Commission launched a web-based public consultation in December 2013 that remained open until 24 February 2014. The questionnaire sought to get the opinion of respondents on their experiences as producers or users of spatial data related to INSPIRE with a series of closed questions against which the respondents could express their views on a 5-point scale (agree strongly, agree, no opinion, disagree, disagree strongly). Three open-ended questions were also provided to gather views on the key challenges encountered in implementing/using INSPIRE, key benefits and key suggestions for changes for the future.

The questionnaire was promoted through the INSPIRE website and INSPIRE Forum, and with direct emails to the INSPIRE NCPs, as well as through mailing lists of experts and participants at the INSPIRE conferences. As a result, almost 700 valid replies were received, of which 70 % were from the public sector, and 30 % from the private sector, academia and the general public. Over 400 comments were received in each of the open-ended questions at the end of the questionnaire. The feedback from the questionnaire is included in the relevant sections of this report, providing a very important perspective to this mid-term evaluation. A summary report of the consultation is available from the INSPIRE website ⁽¹⁵⁾.

⁽¹²⁾ <http://inspire.jrc.ec.europa.eu/index.cfm/pageid/6/list/4>.

⁽¹³⁾ <http://inspire-geoportal.ec.europa.eu>.

⁽¹⁴⁾ http://inspire.ec.europa.eu/reports/INSPIRE_Direct_Observations_2014.pdf.

⁽¹⁵⁾ http://inspire.ec.europa.eu/reports/consultations/INSPIRE_Public_Consultation_Report_final.pdf.

4 State of implementation

4.1 Legal transposition of the directive

4.1.1 Background

The EU cannot achieve its policy goals if EU law is not effectively applied by the Member States. The respective responsibilities for the Commission and the Member States are clearly defined in the Treaties. According to Art. 17 of the Treaty on European Union (TEU), the Commission is the guardian of the Treaties and has a duty to ensure the application of EU law under the control of the Court of Justice of the European Union (the Court). Hence, the Commission has the responsibility for monitoring Member States' efforts and ensuring compliance with EU law, including resorting to formal legal procedures. The TEU also states (Art. 4(3)) that the principle of sincere cooperation should lead the Union and the Member States to assist each other in carrying out tasks that flow from the Treaties.

The Commission works in partnership with Member States to try and solve in an efficient and satisfactory manner, in accordance with EU law, problems and complaints concerning the application of EU law before starting formal infringement procedures. Should these problem-solving efforts not be successful, the Commission can decide to launch a formal infringement procedure under Art. 258 of the Treaty on the Functioning of the European Union (TFEU). The infringement procedure entails a pre-litigation phase and, at a later stage, a litigation phase.

The infringement procedure can be initiated following complaints by either individual citizens or businesses. They can also be detected through own investigations ('own initiative' cases) of the Commission. The Commission also opens infringement procedures when a Member State does not communicate national implementing measures for EU directives. There are three main types of infringements to EU law and several formal stages in the infringement procedure:

1. Failure to notify (non-communication cases): these are cases initiated by the Commission against

a Member State for failing to adopt measures transposing a directive.

2. Non-conformity/non-compliance: these are cases initiated by the Commission against a Member State whose legislation is not in line with the requirements of EU legislation.
3. Incorrect/bad application: cases of bad application are those in which national legislation is not applied correctly or not at all. Most of the complaints received by the Commission concern the bad application of EU law.

This section of the document presents the status of transposition, conformity and application of INSPIRE in the EU Member States.

4.1.2 Status of legal transposition

The Member States are responsible for correctly applying EU law, with the obligation to transpose directives correctly and timely into national legislation.

The INSPIRE Directive had to be transposed by 15 May 2009.

The Member States must communicate to the Commission the texts of national legislation transposing the directives. If a Member State does not communicate or only partially communicates its domestic law(s) transposing EU directives, the Commission opens an infringement case.

In the case of INSPIRE, one Member State transposed the directive in time. The Commission initiated infringement cases against 26 Member States for failing to adopt measures in a timely manner for transposing the directive. For five Member States the cases could be withdrawn before their transfer to the Court of Justice of the European Union. For 19 Member States the cases could be closed before a court ruling. Two countries were subject to court rulings for non-communication.

By April 2011, the 27 Member States had transposed INSPIRE in domestic law and communicated the text to the Commission. Croatia became the 28th Member State of the EU on 1 July 2013 and transposed INSPIRE in national legislation in May 2013 (NN 56/2013), although the text is not yet registered on the official site of EU legislation ⁽¹⁶⁾.

4.1.3 Conformity/compliance

Once the texts have been communicated, the Commission conducts a full conformity assessment in order to validate their adequacy in terms of transposition into national law of the terms of the directive.

Following the Communication 'A Europe of results — applying Community law' ⁽¹⁷⁾ (COM(2007) 502 final), a pre-infringement informal dialogue procedure was established in 2008 with what is known as the EU Pilot database. The objective of the EU Pilot is to find quicker and better responses to enquiries and positive solutions to complaints. It provides a framework for the Commission departments and Member States authorities to work closely together in the spirit of sincere cooperation to ensure the correct application of EU law (partnership approach). The EU Pilot contributes to an efficient solution by which Member States are requested to provide the necessary clarifications, information and remedies within set deadlines. When no satisfactory solution is proposed, the Commission takes further action, including through infringement proceedings.

For INSPIRE, the Commission conducted the necessary conformity assessment studies once the domestic laws had been fully communicated by the Member States. The Commission started in the second semester of 2013 pre-infringement informal EU Pilots based on the outcome of these assessments. As of April 2014, 14 Member States were involved in EU Pilots where INSPIRE measures seem to be missing in the domestic laws, and/or where they seem to have been incorrectly or incompletely transposed. For seven Member States, the dialogue clarified the issues and the case could be closed. For two Member States, the Commission initiated infringement cases through letters of formal notice informing them on the incorrect and/or incomplete

transposition of certain provisions under the directive. Depending on the further outcome of the conformity assessments and the EU Pilot dialogues with the remaining Member States, it is possible that more infringement cases will follow.

4.1.4 Incorrect/bad application

So far, the Commission did not yet start any infringement procedure with regard to the incorrect or bad application of INSPIRE in Member States, either on its own initiative or on the basis of formal complaints received (none received).

The Member States' reports do not contain information on complaints or procedures. The United Kingdom (UK) has been identified as having a formal complaints process in place ⁽¹⁸⁾. In some countries, stakeholders are given the possibility to file comments and/or complaints via the national portal or dedicated email addresses (for example, the Swedish national website ⁽¹⁹⁾). The NCPs of five countries responded to an ad hoc request from the Commission for information on complaints received and procedures applied. In general, no formal procedures are put in place although the possibility to comment/question is provided. None of the five countries received or processed 'complaints'.

4.2 Coordination

4.2.1 Coordination at the EU level

According to Art. 19(1) of the INSPIRE Directive, the Commission is responsible for coordinating INSPIRE at the EU level and shall be assisted for that purpose by relevant organisations and, in particular, by the EEA.

Until the end of 2012, EU-level coordination was ensured by the INSPIRE Coordination Team (CT), which consisted of staff from the three Commission services: Directorate-General for Environment (DG ENV), Eurostat and JRC. The main role of the CT was:

1. to coordinate the development of the implementing rules;

⁽¹⁶⁾ <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1397817042633&uri=CELEX:72007L0002HRV%2801%29>.

⁽¹⁷⁾ European Commission, COM(2007) 502 final 'A Europe of results — applying Community law' (http://ec.europa.eu/eu_law/eulaw/pdf/com_2007_502_en.pdf).

⁽¹⁸⁾ <http://data.gov.uk/library/guidance-on-inspire-complaints-and-appeals>.

⁽¹⁹⁾ <http://www.geodata.se>.

2. to act in support for implementation in the Member States;
3. to foster coordination with INSPIRE-related developments of the environmental *acquis* and other policy developments and initiatives at the EU level. Where relevant, this could involve global developments such as the Copernicus programme ⁽²⁰⁾, the Shared Environmental Information System (SEIS) ⁽²¹⁾, and the Global Earth Observation System of Systems (GEOSS) ⁽²²⁾. In this effort, the INSPIRE CT is assisted by the Commission inter-services group on Geographic Information (COGI) chaired by Eurostat and, where relevant, by the EEA.

As the development of the INSPIRE implementing rules is coming to an end, the emphasis of EU-level coordination has gradually shifted towards INSPIRE implementation and maintenance, with the creation of the INSPIRE Maintenance and Implementation Framework (MIF) in 2013 (see the 'Communication' section below). Given this shift and the need to strengthen the integration of INSPIRE with other EU-level initiatives, reporting and information dissemination under the environmental *acquis*, the EEA increased its involvement since 2013 in EU-level coordination (in line with INSPIRE Art. 19). In particular, the EEA has taken responsibility for tasks related to data and service sharing and to monitoring and reporting under INSPIRE and the mid-term policy evaluation. At the same time, Eurostat continues to chair the COGI and represents INSPIRE at the international United Nations initiative on Global Geospatial Information Management (UN-GGIM) ⁽²³⁾. Eurostat will also step up its activity as the coordinator of INSPIRE implementation within the European Commission and as a data custodian for EU-level INSPIRE thematic data, and support the statistical community in Europe in implementing INSPIRE for the statistics-related themes.

The changes in the EU-level coordination structure of INSPIRE have been a logical consequence of the evolution of its implementation. The commitment of the EEA will result in greater efficiency, as the new EC/EEA INSPIRE Team will be pooling resources

for organising workshops, studies and software development, as well as policy effectiveness, inter alia, by integrating INSPIRE in the reporting processes, and through the evaluation of the INSPIRE policy actions.

The roles in the current setting of the INSPIRE CT are that DG ENV acts as legislative and policy coordinator, while JRC takes the main responsibility for the technical coordination. EEA is supporting the JRC and DG ENV, and contributes together with the European Environment Information and Observation Network (Eionet) to the integration of INSPIRE with other EU-level initiatives. National perspectives are added to the European coordination by the INSPIRE Committee, a regulatory committee of Member States representatives. The INSPIRE Committee has the general task to assist the Commission and to deliver its opinion in the form of a vote on the draft implementing rules proposed by the Commission ⁽²⁴⁾.

Communication

Since 2007, the European Commission has been organising a yearly INSPIRE conference ⁽²⁵⁾. These conferences provide a forum for stakeholders from government, academia and industry to hear about and discuss the latest developments of the INSPIRE Directive and the developments in national and community-specific spatial data infrastructures (SDIs). The conferences are organised through a series of plenary sessions addressing common policy issues, and parallel sessions and workshops focusing in particular on applications and implementations of SDIs, research issues, and new and evolving technologies and applications. Over the years, the focus of the conference has shifted. While initially it was largely covering the development of the implementing rules and technical guidelines, in recent years the focus has moved towards INSPIRE implementation and use, and the link with new policy and technology development like Open Data and Linked Data.

The INSPIRE website ⁽²⁶⁾ is the central access point to all official information around INSPIRE. It includes a rich document archive of all INSPIRE-related documents and has thus been

⁽²⁰⁾ www.copernicus.eu.

⁽²¹⁾ <http://ec.europa.eu/environment/seis>.

⁽²²⁾ <http://earthobservations.org>.

⁽²³⁾ <http://ggim.un.org>.

⁽²⁴⁾ <http://inspire.ec.europa.eu/index.cfm/pageid/481> online.

⁽²⁵⁾ The INSPIRE conferences have evolved from the European Commission GI & GIS workshops, which were held yearly since 1995. <http://inspire.ec.europa.eu/index.cfm/pageid/501>.

⁽²⁶⁾ <http://inspire.ec.europa.eu/index.cfm>.

an invaluable resource for supporting the development of the implementing rules and technical guidelines. It also provides information on the implementation in Member States (e.g. the monitoring information and 3-yearly reports) and about the activities for maintenance and implementation. Discussion among the wider INSPIRE stakeholder community is supported through the INSPIRE Forum ⁽²⁷⁾, while the INSPIRE geo-portal provides access to the data infrastructure (see Section 4.3.3).

Finally, a series of INSPIRE training courses began in 2013 for Commission staff in Brussels, Ispra and Luxembourg. These training sessions are successful in raising the level of awareness about INSPIRE across policy directorates, and facilitate its integration into other policies affecting the environment, as discussed below.

Commission inter-service coordination and communication

There has been a growing awareness within Commission services that INSPIRE is relevant when a policy explicitly deals with location or geographic information. This has been triggered by discussions between the INSPIRE team and staff from other directorates in the Commission during the development of INSPIRE data specifications, and through the process of inter-service consultation, which is one of the internal mechanisms for policy coordination in the Commission. Draft new policies or revision of existing legislation is circulated internally among the relevant directorates for comments. Through this process, the INSPIRE CT has identified links between INSPIRE and other legislation in the environmental and non-environmental domains, and provided the necessary input. This has led to references to INSPIRE in non-environmental policies such as transport (e.g. Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport — hereafter referred to as the Intelligent Transport Systems Directive or ITS Directive, and activities around the modelling language for rail specifications), marine policy (Marine Knowledge 2020, Maritime Spatial Planning), energy (e.g. geothermal database, building specifications with regard to energy efficiency) and public health (e.g. cancer registry, registry of genetically modified organisms).

Thus far, the references to INSPIRE in non-environmental legislation are few — probably because INSPIRE implementation is still ongoing, and it is not yet clear to what extent the harmonised spatial data will be addressing the specific requirements of these other policies. The INSPIRE Directive is mentioned in the recitals (and not in the main text), for instance by saying that coordination with INSPIRE should take place or that INSPIRE should be considered as a potential framework. As the implementation of INSPIRE develops, further providing the European framework for the interoperability of spatial data sets and services, it is necessary to ensure stronger cross-policy integration at both European and national levels to leverage the benefits of this interoperability framework (see Section 7.2.12).

Development of implementing rules

To facilitate the implementation of INSPIRE, and to guarantee that the user requirements, existing initiatives and national developments are taken into consideration, it is important that all stakeholders have the opportunity to participate in the development of the implementing rules. Coordinating this effort was the major task of the European Commission from 2007 to 2014. For this purpose, the Commission put in place an open and participatory consensus-building process, involving data users and providers, industry, researchers and representatives of public authorities. These stakeholders are organised into almost 500 Spatial Data Interest Communities (SDICs) and over 300 Legally Mandated Organisations (LMOs).

The development of the implementing rules and accompanying technical guidelines was strongly supported by experts proposed by the SDICs and LMOs for the INSPIRE drafting teams (DTs) and thematic working groups (TWGs) in response to open calls for participation.

The drafting teams supported the development of the implementing rules and technical guidelines on metadata, network services, data and service sharing and monitoring and reporting, as well as the conceptual framework and the development methodology for the implementing rules on interoperability of spatial data sets and services. The role of the drafting teams was to analyse and review the reference material provided for their topic, and to produce draft implementing rules and the corresponding technical guidelines. Similarly,

⁽²⁷⁾ <http://inspire-forum.jrc.ec.europa.eu>.

the TWGs supported the drafting of the data specifications technical guidelines for the themes of Annexes I to III, which provided the basis for the implementing rules on interoperability of spatial data sets and services. The commitment of all stakeholders has been truly exceptional and resulted in the development, testing, commenting and approval of 10 legal acts and more than 40 detailed technical guidance documents. As an example, the consultation of stakeholders on data specifications for themes of Annex I provided 3 700 comments from 44 LMOs and 31 SDICs, and 8 000 comments for themes of Annexes II and III, involving 160 institutions in the Member States. During the testing phase, 82 SDICs and LMOs tested the data specifications of Annex I themes, submitting 90 reports. Twenty-seven SDICs and 37 LMOs registered for testing Annex II and Annex III themes, each of them leading ad hoc consortia explicitly organised for that purpose, leading to 240 spatial data sets used for testing and 994 comments. INSPIRE has therefore been a major example of stakeholder participation.

Maintenance and implementation

All infrastructures, and INSPIRE is no exception, require maintenance and evolution if they want to remain relevant for serving the purposes for which they have been put in place. Lessons learned by implementing the infrastructure need also to be taken into account to further optimise its performance in order to meet its policy objectives.

The Commission, in agreement with the Member States, has therefore set up in 2013 the INSPIRE MIF, which is based on the same principles as those applied for its development.

The two main pillars of the MIF are a Commission expert group called INSPIRE MIG with representatives of the INSPIRE NCPs, and a pool of experts drawn from the stakeholder community. The first-named MIG is composed of two permanent sub-groups, one for discussions on the political aspects and evolution of INSPIRE and its relationship with other policies, and one for discussions of technical issues. Articles 5 and 6 of the Terms of Reference ⁽²⁸⁾ describe the roles of the two permanent sub-groups as the following:

- The permanent **sub-group on strategic and policy-related aspects** be set up for the specific

purpose of discussing and providing advice on the evolution of INSPIRE and its relationship with other policies, including the endorsement of the MIG's work programme.

The permanent **sub-group on technical aspects** shall be set up for the specific purpose of discussing and providing advice on the technical aspects, including the preparation and regular update of the rolling work programme for INSPIRE maintenance and implementation.

The two main pillars of the MIF are a Commission expert group called INSPIRE MIG with representatives of the INSPIRE NCPs, and a pool of experts drawn from the stakeholder community.

The general tasks of the INSPIRE Maintenance and Implementation Group (MIG) are:

- to bring about an exchange of experience and good practice related to the implementation of the INSPIRE Directive and the implementing rules;
- to identify and give advice about the priority issues to be addressed in the maintenance of the INSPIRE Directive, implementing rules and/or technical guidance documents;
- to identify issues related to INSPIRE implementation (including, but not limited to, technologies, standards, methods, coherence across INSPIRE chapters and communication measures to be adopted) and advise the Commission on how to address them;
- to prepare and regularly update the rolling work programme for INSPIRE maintenance and implementation to be agreed by the INSPIRE Committee and the Commission;
- to discuss the evolution of INSPIRE and its relationship with other policies.

The basis of the work of the MIG — which was formally established and started its work in October 2013 — and its sub-groups will be a common work programme ⁽²⁹⁾ that will be based on issues and change requests submitted by INSPIRE stakeholders. The MIG is composed of two permanent sub-groups, one for discussions

⁽²⁸⁾ Terms of Reference for the Commission expert group on INSPIRE Implementation and Maintenance, <http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetailDoc&id=14550&no=1>.

⁽²⁹⁾ MIG's work program, <http://inspire.ec.europa.eu/index.cfm/pageid/5160/list/wp>.

on the political aspects and evolution of INSPIRE and its relationship with other policies, and one for discussions of technical issues. Articles 5 and 6 of the Terms of Reference ⁽³⁰⁾ describe the roles of the two permanent sub-groups as the following:

- The permanent **sub-group on strategic and policy-related aspects** be set up for the specific purpose of discussing and providing advice on the evolution of INSPIRE and its relationship with other policies, including the endorsement of the MIG's work programme.
- The permanent **sub-group on technical aspects** shall be set up for the specific purpose of discussing and providing advice on the technical aspects, including the preparation and regular update of the rolling work programme for INSPIRE maintenance and implementation.

The MIG will be complemented by a pool of experts whose members will be called upon when MIG sub-groups are formed to address specific implementation or maintenance issues, but will also provide the opportunity to reach out to experts involved or interested in particular aspects of INSPIRE implementation or maintenance.

4.2.2 Coordination at the national level

In the INSPIRE Directive, Art. 18 requires Member States to establish an appropriate coordinating infrastructure:

Member States shall ensure that appropriate structures and mechanisms are designated for coordinating, across the different levels of government, the contributions of all those with an interest in their infrastructures for spatial information.

These structures shall coordinate the contributions of, inter alia, users, producers, added-value service providers and coordinating bodies, concerning the identification of relevant data sets, user needs, the provision of information on existing practices and the provision of feedback on the implementation of this Directive.

As a result of this Article, the Member States have established coordinating structures, often regulated

by the national legal acts transposing the INSPIRE Directive. These structures follow common patterns but also show some differences in their internal set-up, reflecting the institutional differences of each country. As a general pattern, the national coordination structures include an NCP defined by INSPIRE Directive Art. 19, a Coordination Secretariat and a Stakeholder Board (although the names vary from country to country).

Centralised and decentralised coordinating structures

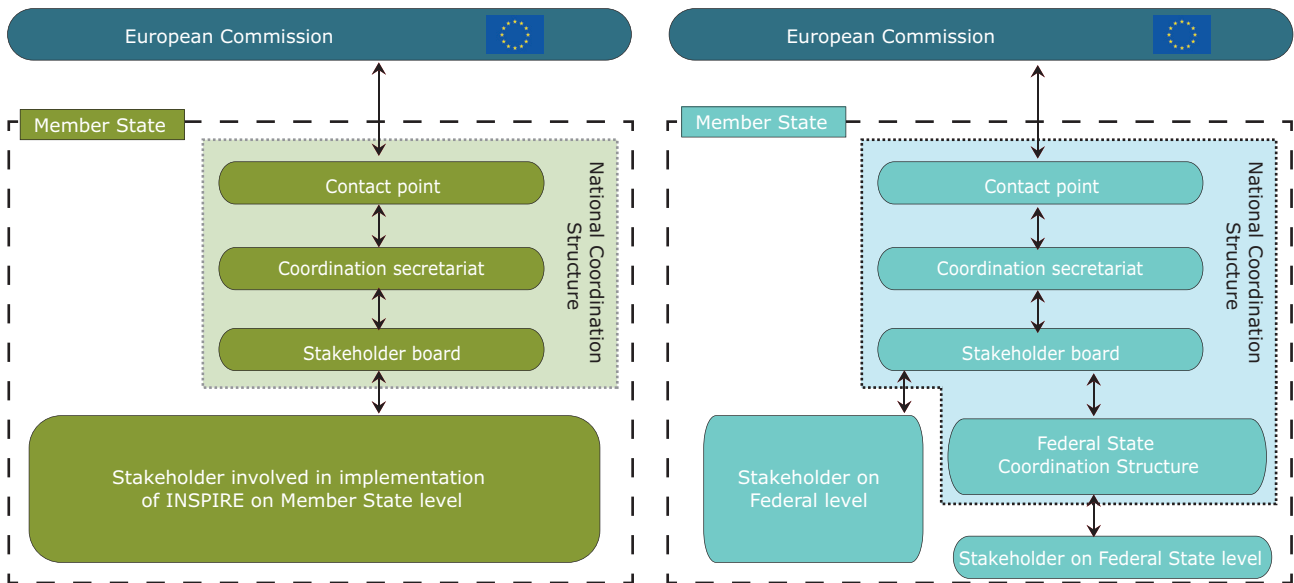
The main differences in the coordination structures across the Member States reflect the federal or centralised institutional framework of the different countries. In a federal governmental system (e.g. Germany or Austria) the European directives have to be implemented both at federal and at state levels. As a result, the decentralised governmental structures in federally organised countries are more articulated than in the centralised countries. Figure 4.1 shows a comparison between a generic centralised and a generic decentralised national coordination structure related to the INSPIRE Directive.

The difference in general organisation does not imply automatically an advantage or disadvantage for stakeholders. A federal structure is more likely to address and integrate a larger number of stakeholders especially at the sub-national level than a centralised system. On the other hand, it may become more difficult for local stakeholders to influence the decisions and the implementation at the federal level as several layers of government may act as filters. The number of replies to public consultation of INSPIRE can be partly associated with the form of coordination structure: the three countries with by far the most replies — namely France, Germany and Spain — build on a regional distributed coordination structure that might be one of several influencing factors on the number of participating stakeholders, especially at the sub-national level.

Among the countries that are not constitutionally federal, there is a range of approaches reflecting the degree to which regional governments are active and able to exert their influence. In countries where INSPIRE is only represented at the national level, local-level stakeholders may be represented by associations in the stakeholder board or not

⁽³⁰⁾ Terms of Reference for the Commission expert group on INSPIRE implementation and maintenance (<http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetailDoc&id=14550&no=1>).

Figure 4.1 Generic models of coordinating structures in federal and centralised Member States



represented at all. The latter case may impact on the motivation of local stakeholders to participate actively in INSPIRE implementation.

As an overall observation, local stakeholders' influence or impact on the governance structures decision is in the majority of the Member States (federal or not) very low. Local authorities are in many ways distant from the central decisions and communication. This is supported by the public consultation, which identified the improvement of coordination especially regarding local governments as one of the major areas for changes.

Role of the leading organisation

The coordinating structures in the Member States can also be considered in relation to the organisations taking the lead. In many countries, the lead has been assigned to the National Mapping and Cadastral Agencies (NMCAs), while in others it is the ministry for the environment, or equivalent, that is taking the lead. In a few cases, other ministries (e.g. informatics or communications) take the leading role.

NMCAs have played a key role in the initial discussions on the formulation of the INSPIRE Directive, and contributed heavily to the development of the technical specifications for Annex I, in which they are the key data provider, as well as to the specifications for spatial data services. For Annexes II and III other organisations

have also played an important role, including national statistical institutes, geological services and environmental agencies.

Regardless of who has taken the lead in each Member State, most of the actors involved in the development of the technical specifications have been the larger national agencies that have the human, technical and financial resources to contribute to the development of the implementing rules. Specialised government institutions as well as regional or local public authorities that are responsible for several Annex III themes have not been involved to the same degree. This is partly due to resource availability and partly because of the very fragmented and diverse organisational structure of local government in Europe, with over 100 000 entities, most of which are very small, and partly due to derogation for public authorities operating at the lowest level of government according to Art. 4 (6) of the INSPIRE Directive. This clearly poses challenges for the implementation of INSPIRE in the coming years as a major effort of awareness raising and technical support is needed to bring INSPIRE to the level of local government. These challenges pose also questions on the ability of the education and training system in Europe to provide the number of skilled technical staff necessary to implement and use INSPIRE spatial data and services in the future (see Section 7.2.3 with respect to 'Organisational structures and coordination').

Stakeholder board

Given the challenge discussed above an important role in many countries is taken by the stakeholder board (or equivalent name). This is not specifically required by the INSPIRE Directive, but many countries have found it a useful mechanism of coordination.

The typical stakeholder board contains only the major data providers among the public authorities, such as the NMCA, ministry of environment, environmental agency, national statistical office, military mapping offices and so on. Furthermore, some boards also include representatives of municipalities (e.g. national association of municipalities) and third-party organisations such as the national association for geographic information, or equivalent, representing the economic or research sector. In general, the number of participants in the stakeholder boards is rather limited, typically ranging between 10 and 20 representatives. In many cases, the stakeholder board is responsible for providing advice to members and the national coordinating body, and for setting up working groups on specific topics. In other cases, it has much more power and is able to set strategic directions that the national coordinating body has to follow. In this case, the stakeholder board and its representatives check the executive power of the coordination secretariat and have effective power on the implementation of INSPIRE in their country.

There are different mechanisms for the establishment and operation of the stakeholder board. In most cases, the institutions and their number of representatives in the stakeholder board are regulated by the national SDI law transposing INSPIRE or by ministerial order. Only in a few cases does the stakeholder board or the coordination secretariat have the freedom to decide its membership and model of operation.

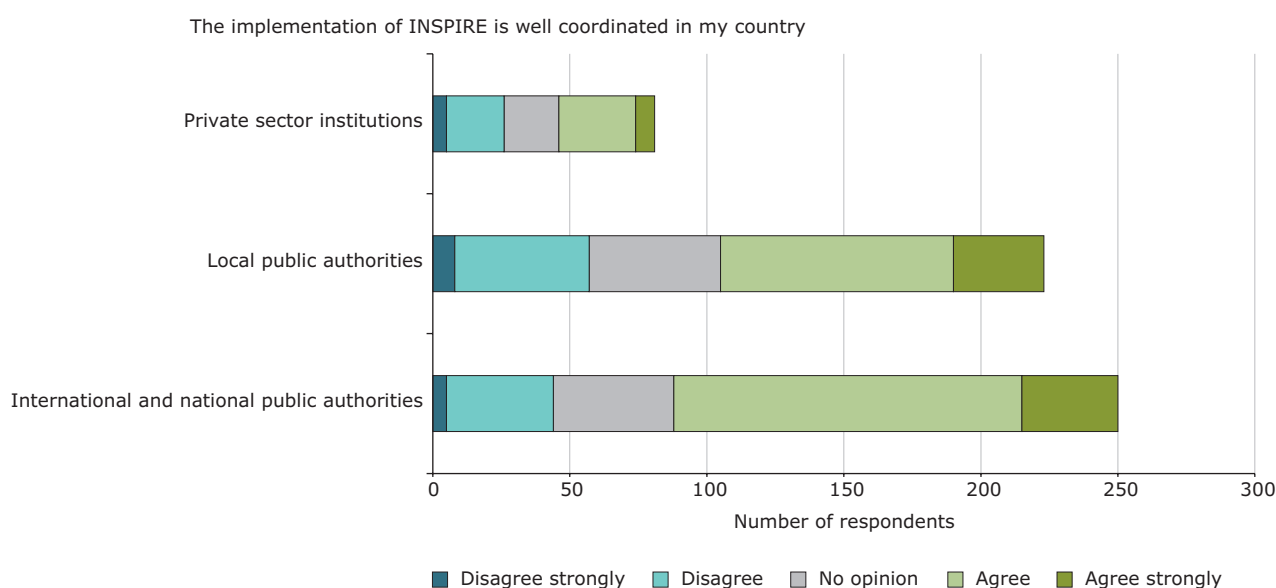
The flexibility of membership of the stakeholder board is of special importance considering the rebalancing of stakeholder participation that may become necessary during the implementation of Annex III.

Effectiveness of national coordination

While it can be stated that the national coordinating structures and NCPs have been established by the Member States according to the obligations laid down by the INSPIRE Directive in Articles 18 and 19, neither their effectiveness nor their efficiency can be assessed directly. Furthermore, there is no mechanism in place to monitor whether or not all relevant levels of government are involved as requested by Art. 18.

As stated previously, the objectives of the coordination structures are to engage stakeholders and to coordinate and support their distributed efforts in implementing INSPIRE. This implies intensive communication with stakeholders on

Figure 4.2 Responses to question on national coordination in the 2014 INSPIRE public consultation by type of organisation



national but also local level. While the national stakeholders seem to be represented in the coordination structures it is difficult to assess how the integration of local stakeholders progresses. The results of the public consultation show that there is some variation in the perception of national-level public sector organisations, local public sector ones and the private sector on the extent to which the implementation of INSPIRE is well coordinated in their country (see Figure 4.2). As shown, the level of agreement and strong agreement with the question declines from 70 % for public sector national organisations to 44 % for both local public sector and private sector. This suggests that there is clearly room for improvement in better engaging both the local level and private sector in INSPIRE implementation.

Another condition indicating a higher degree of efficiency in INSPIRE implementation is the existence of a wider strategy integrating INSPIRE into related initiatives such as eGovernment, Open Data or national SDIs extending beyond the environmental focus of INSPIRE. In most cases, the existence of such wider strategies is the result of greater political awareness and commitment, and a greater degree of collaboration among key government departments (e.g. ministry of finance). INSPIRE implementation can benefit heavily from being embedded in a national strategy such as eGovernment. In fact, the responses on the public consultations show a correlation between the high satisfaction with INSPIRE coordination on national level and the existence of a strategy framing the implementation of INSPIRE.

4.3 Implementing rules

This section evaluates the state of implementation of the implementing rules addressing the key components of INSPIRE discussed in Section 2.3.

4.3.1 Metadata

The implementing rules for metadata were adopted in December 2008. They provide details of the metadata elements necessary to implement the requirements of the INSPIRE Directive. In particular, Art. 5 of the Directive requires that:

1. Member States shall ensure that metadata are created for the spatial data sets and services

corresponding to the themes listed in Annexes I, II and III, and that those metadata are kept up to date.

2. Metadata shall include information on the following:
 - a) the conformity of spatial data sets with the implementing rules provided for in Art. 7(1);
 - b) conditions applying to access to, and use of, spatial data sets and services and, where applicable, corresponding fees;
 - c) the quality and validity of spatial data sets;
 - d) the public authorities responsible for the establishment, management, maintenance and distribution of spatial data sets and services;
 - e) limitations on public access and the reasons for such limitations, in accordance with Art. 13.
3. Member States shall take the necessary measures to ensure that metadata are complete and of a quality sufficient to fulfil the purpose set out in Art. 3(6).

The metadata must be searchable through discovery services provided by the Member States based at a minimum on the criteria set in Art. 11(2) of the Directive and detailed in Section 4.3.2 of this report.

Article 6 of the Directive indicates that the Member States have two years from the adoption of the metadata implementing rules to create conformant metadata for Annexes I and II, and five years for Annex III. The relevant deadlines were therefore December 2010 for Annexes I and II, and December 2013 for Annex III. The Member States are also asked in Art. 15 to provide access to their discovery, view, download, transformation and invoke services through the INSPIRE geo-portal operated by the European Commission, in addition to their own.

The latest monitoring tables provided by the Member States (2013) ⁽³¹⁾ refer to 2012 data, and therefore do not yet include all the metadata for Annex III. Table 4.1 summarises the status as reported by the Member States.

⁽³¹⁾ <http://inspire.ec.europa.eu/index.cfm/pageid/182/list/maptwo>.

On average, 77 % of Annex I, 66 % of Annex II and 39 % of Annex III data were documented with INSPIRE-compliant metadata in 2012. Note that Annexes I and II were required by December 2010. As the table shows, only 9 out of 27 countries had more than 90 % of their data from Annexes I and II documented with compliant metadata. Some countries were getting close, but several were considerably behind, particularly on Annex II. Issues are also evident on the metadata for services, as only 56 % on average were documented with INSPIRE-compliant metadata, with 8 countries facing significant delays.

The independent study (Section 3.3) shows a less positive picture than the one reported by the Member States. From the 752 selected data sets reported by the Member States in the INSPIRE

monitoring and reporting, only 57 % could be found back through the INSPIRE geo-portal. The figures vary from 15 % for Greece to 90 % for Finland. There seem to be two kinds of problems that contribute to this:

1. Many of the resources described in the monitoring and reporting sheets can be found, but have different 'names' in the metadata found in the geoportal. This made linking of corresponding resources sometimes cumbersome. Extracting the monitoring and reporting list of data sets directly from the catalogue could solve this problem.
2. There is still some confusion/misunderstanding on how to report the spatial data sets and services, especially when the services are not

Table 4.1 Status of metadata as reported by the Member States in 2013 (refers to 2012)

	% data sets with compliant MD			% services with compliant MD
	Annex I	Annex II	Annex III	
Austria	99	97	11	91
Belgium	73	71	61	25
Bulgaria	2	5	4	25
Cyprus	0	0	0	0
Czech Republic	81	100	75	62
Denmark	100	0	0	81
Estonia	100	100	7	71
Finland	99	100	80	72
France	90	91	74	77
Germany	70	92	49	83
Greece	41	20	27	18
Hungary	78	41	10	13
Ireland	65	69	19	54
Italy	78	77	74	65
Latvia	85	87	70	78
Lithuania	93	91	83	100
Luxembourg	100	100	99	94
Malta	88	0	0	67
Netherlands	100	100	1	89
Poland	82	21	33	18
Portugal	100	100	86	92
Romania	58	65	28	4
Slovakia	80	99	17	89
Slovenia	68	43	24	0
Spain	63	46	26	66
Sweden	100	100	62	84
United Kingdom	100	100	87	100

always carefully documented. Many 'services' are in reality URLs to portals or mapping applications. This overestimates sometimes the number of resources reported in the monitoring and reporting tables.

Most metadata records for spatial data sets tested by the independent study are still not fully compliant with the metadata regulation. The type of issues/errors observed can be summarised as follows:

1. The conformity element is very often missing or not completed. This seems to be 'normal' since many Member States did not yet test conformity of the spatial data sets and therefore leave this metadata element open. In fact, until December 2013 the technical guidelines stated that the proper encoding for 'not tested' was to leave the conformity statement out. If we would take out this element from the analysis, the compliance rate rises to 70 % or more, which is consistent with what was reported by the Member States.
2. Nevertheless, many other metadata elements are sometimes missing:
 - condition of use;
 - limitations of public access;
 - missing INSPIRE themes/keywords covered;
 - invalid URLs and URL issues;
 - incomplete coordinate reference system;
 - missing bounding box.
3. There are several issues related to schema validation that need particular attention.
4. There is an issue with the data service coupling that establishes the link between metadata on data sets and services. Metadata technical guidelines are unclear in this respect and there are many missing/faulty implementations.

These gaps are consistent with the returns of the public consultation: two thirds of users reported that they could find the Annex I and Annex II data they were looking for through discovery services and with metadata (not necessarily INSPIRE-compliant), but the remaining one third could not find the data, or when found it had limited or no metadata.

One of the key problems in finding relevant data sets is that the keywords used to label the resources

are too few or are misleading to the users. This is a problem that would be resolved if there were mechanisms for users to provide feedback to data providers, and one that should be addressed in the maintenance process of INSPIRE.

In the public consultation some 400 comments were made in relation to the challenges encountered with respect to INSPIRE, with 96 comments that included a reference to metadata. From the public sector providers most comments refer to complexity of specifications, lack of tools, and time needed to create the metadata for those resources that did not have them in the first place. Users largely commented on the need to have more metadata, as could be expected. Metadata also featured, however, in 50/400 comments on greatest benefits of INSPIRE. Mostly these referred to the benefit of having clearer and more consistent documentation of public sector data, acting as the basis for discovery services. Other noticeable benefits derive, however, from the contribution of INSPIRE to changing the culture in public administrations. For example, the United Kingdom commented:

Implementation in the UK supported the growth of an Open Data culture. In particular the identification and cataloguing of data sets held by public authorities supported moves towards open government. Public bodies required to publish data under INSPIRE made other non-INSPIRE data sets open for sharing. While we can't attribute only to INSPIRE the high volume of UK data now publicly available, it has certainly played a significant part.

4.3.2 Network services

The implementing rules for network services were adopted in October 2009 for the discovery and view services and in December 2010 for the download and transformation services. They provide the technical specifications for the network services necessary to implement the requirements of the INSPIRE Directive. In particular, Art. 11(1) of , requires that:

Member States shall establish and operate a network of the following services for the spatial data sets and services for which metadata have been created in accordance with this Directive:

- a) discovery services making it possible to search for spatial data sets and services on the basis of the content of the corresponding metadata and to display the content of the metadata;

- b) view services making it possible, as a minimum, to display, navigate, zoom in/out, pan, or overlay viewable spatial data sets and to display legend information and any relevant content of metadata;
- c) download services, enabling copies of spatial data sets, or parts of such sets, to be downloaded and, where practicable, accessed directly;
- d) transformation services, enabling spatial data sets to be transformed with a view to achieving interoperability;
- e) services allowing spatial data services to be invoked.

Those services shall take into account relevant user requirements and shall be easy to use, available to the public and accessible via the Internet or any other appropriate means of telecommunication.

The discovery services provided by the Member States must accept queries based at a minimum on the following combination of search criteria (Art. 11(2) of the INSPIRE Directive):

- a) keywords;
- b) classification of spatial data and services;
- c) quality and validity of spatial data sets;
- d) degree of conformity with the implementing rules provided for in Art. 7(1);
- e) geographical location;
- f) conditions applying to the access to and use of spatial data sets and services;
- g) public authorities responsible for the establishment, management, maintenance and distribution of spatial data sets and services.

Spatial data sets can be made available in conformity with the implementing rules either through the adaptation of existing spatial data sets or through the transformation services referred to in point (d) of Art. 11(1) of the INSPIRE Directive (see above). In the latter case, the transformation services must combine with the other network services (discovery, view, download, invoke) and conform to the implementing rules provided for in Art. 7(1) of the INSPIRE Directive.

In Art. 12 of the INSPIRE Directive, the Member States are also asked to ensure that public authorities are given the technical possibility to link their spatial data sets and services to the network referred to in Art. 11(1) of the INSPIRE Directive. This possibility should be offered as well to third parties once their metadata, spatial data sets or services comply with the relevant implementing rules.

In Art. 15 of the INSPIRE Directive, the Member States are requested to provide access to their network services through the INSPIRE geoportal established and operated at Community level (see Section 4.3.3 of this report).

Member States were requested to provide their discovery and view services no later than November 2011 in conformity with the relevant implementing rules, and by no later than December 2012 Member States were requested to provide their download and, if selected, their transformation services in conformity with the relevant implementing rules.

When the mid-term evaluation report was created, the latest available monitoring tables provided by the Member States referred to the year 2012. All given statements based on INSPIRE monitoring are referring therefore to 2012; the monitoring tables provided by the Member States (2013) refer to 2012 data, and therefore should include discovery, view, download and transformation services. Table 4.2 summarises the 2012 status as reported in 2013 by the Member States. The updated monitoring results describing the situation of 2013 are available from the INSPIRE website. The 2013 monitoring results indicate considerable improvements in availability and conformity in some countries.

On average, 63 % of the metadata for the spatial data sets and services are available through the discovery services, and 27 % of the spatial data sets are available through the view and download services. Note that only Annexes I- and II-compliant metadata were required in 2012. As the table shows, only 7 out of 27 countries had more than 90 % of the metadata available through the discovery services, and only 4 had more than 50 % of their spatial data sets available through view and download services.

On average, the services received close to 1 million requests per year, but, as the table shows, only 9 countries received 1 million or more requests per year.

On average, 41 % of the services were in conformity with the implementing rules. Note that the download and transformation services were

requested to be compliant in December 2012 at the end of the reporting period. As the table shows, only six countries had more than 70 % of the services compliant with the implementing rules.

Some countries were getting close in terms of availability and conformity, but several were considerably behind on all accessibility indicators, particularly on the accessibility of spatial data sets through view and download services. Issues are also evident on the conformity for services, as 10 countries had less than 3 % of their services in conformity with the implementing rules.

The independent study confirms the data reported by the Member States in 2013 and provides some additional insights on the status.

For what concerns discovery services, the major issues identified are:

1. Absence of discovery services. There are six Member States that did not (yet) define a discovery/catalogue service as an endpoint in the INSPIRE geo-portal. In other countries, only part of the territory is covered.
2. Completeness of served metadata and number of discovery services. It is not always clear if the national discovery/catalogue service is a service that harvests all the relevant catalogues in the country. Some countries have defined one of their discovery services as the endpoint in the INSPIRE geo-portal, although it is a discovery service of only one (important) spatial data provider.
3. Compliance with the service definition. An important number of the reported discovery services are in practice not services but rather refer to URLs of a geoportal, or to web mapping applications.

For what concerns the 350 view and download services investigated, the outcome was:

1. Availability of the services description in the INSPIRE geo-portal. Only 41 % of the services can be found back in the INSPIRE geo-portal with a very wide disparity across countries (from 0 to 92 %).
2. Services accessibility. From the services that could be found in the INSPIRE geo-portal 62 % could be accessed. Some of the services cannot be accessed because the URL is not functioning properly (at least at the time of testing), or access

is regulated through authentication/authorisation mechanisms that the INSPIRE geo-portal cannot handle. An activity is ongoing in the context of the MIF to facilitate an interoperable approach to authentication and authorisation.

3. Compliance with the services technical guidelines. From all the tested services of the INSPIRE geo-portal, only 5 % of these services were compliant.

The type of issues/errors that can be observed can be summarised as follows:

- GetCapabilities usually work with a few exceptions. However, getMap is not always working, or it works (when testing in a GIS like QGIS) but is not conformant.
- There are problems with some of the layers of the services.
- There are problems with malformed URLs creating errors when using them.
- Several services have schema validation issues.

Some of the trends are consistent with the returns of the 2014 public consultation:

- Access to metadata and spatial data sets: 51 % of respondents reported that their organisation's spatial data sets and services were discoverable through web services with a significant portion indicating an incomplete discoverability, and 53 % indicated that their organisation's spatial data sets were viewable through web services with a significant portion indicating an incomplete access. Only 32 % reported that their organisation's spatial data sets were downloadable with a significant percentage indicating the non-availability for download.
- Compliance with implementing rules: 48 % of respondents reported that the discovery services were compliant with the implementing rules, 43 % declared that their view services were compliant with the implementing rules and 37 % indicated that the download services were compliant with the implementing rules.

One of the key problems is that not all Member States have implemented the network services. Among the ones available only very few are compliant with the implementing rules and they serve only a sometimes small sub-set of the Member States' spatial data sets. There is also work needed

Table 4.2 Status of services as reported by the Member States in 2013 (refers to 2012)

	Accessibility of metadata through discovery services	Accessibility of spatial data sets through view and download services	Use of network services	Conformity of network services to the implementing rules
	%	%	(in 1 000 services requests/year)	%
Austria	51	31	571	82
Belgium	53	37	5 779	56
Bulgaria	5	3	0	0
Cyprus	10	0	0	33
Czech Republic	96	18	79 731	55
Denmark	87	90	0	23
Estonia	62	6	18	75
Finland	91	10	91 588	3
France	100	17	30 193	1
Germany	66	16	5 143	50
Greece	32	26	0	0
Hungary	23	9	5 598	24
Ireland	34	19	0	79
Italy	0	0	4	57
Latvia	78	13	60	19
Lithuania	99	7	1	0
Luxembourg	97	98	14 406	100
Malta	100	57	0	0
Netherlands	76	46	1 171	95
Poland	63	22	0	89
Portugal	0	0	0	0
Romania	33	1	1 492	2
Slovakia	78	7	13	69
Slovenia	72	76	0	0
Spain	45	13	7 131	52
Sweden	82	30	938	43
United Kingdom	94	14	940	100

on the validation and conformance testing itself, which is why this activity is being included in the Maintenance and Implementation work programme.

In the public consultation, some 400 comments were made in relation to the challenges encountered with respect to INSPIRE. More than half (240) of the comments included a generic reference to services.

Most of the challenges identified were related to costs, especially for small organisations, such as for setting up web services with limited and even decreasing resources. Some indicated the standards are not ready and stressed the lack of available

software packages compliant with the INSPIRE implementing rules. However, some noted that setting up web services for INSPIRE is still a work in progress and some benefits linked to cultural changes were identified — for example, a user from a French data provider indicated:

INSPIRE was an excellent way to convince hierarchy to pay attention to web services, SOA principles ... so that the organisation was able to open its own geoportal. It also gave the organisation the first impetus to enter the world of metadata so that they are now part of our everyday working life.

4.3.3 INSPIRE geo-portal

Article 15 of the INSPIRE Directive stipulates that 'The Commission shall establish and operate an INSPIRE geo-portal at Community level' and that 'Member States shall provide access to the services referred to in Article 11(1) (i.e. the INSPIRE network services) through the INSPIRE geo-portal ...'.

The INSPIRE Directive further states that 'Member States may also provide access to those services through their own access points.'

The INSPIRE geo-portal operated by the Commission implements these elements of the directive by operating an online register where Member States' contact points can register the service endpoints of their national or regional INSPIRE discovery services. The INSPIRE geo-portal then regularly harvests the metadata from these registered discovery services and uses the information present in the service metadata to dynamically discover the other INSPIRE network services (view, download, transformation and invoke). This approach allows to reflect correctly the evolving landscape in the availability of INSPIRE services.

Important to note in this concept is that the INSPIRE geo-portal mirrors the content of the national or regional INSPIRE discovery services, but that no such link exists with the 'Member States' ... own access points', as referred to in the directive. The

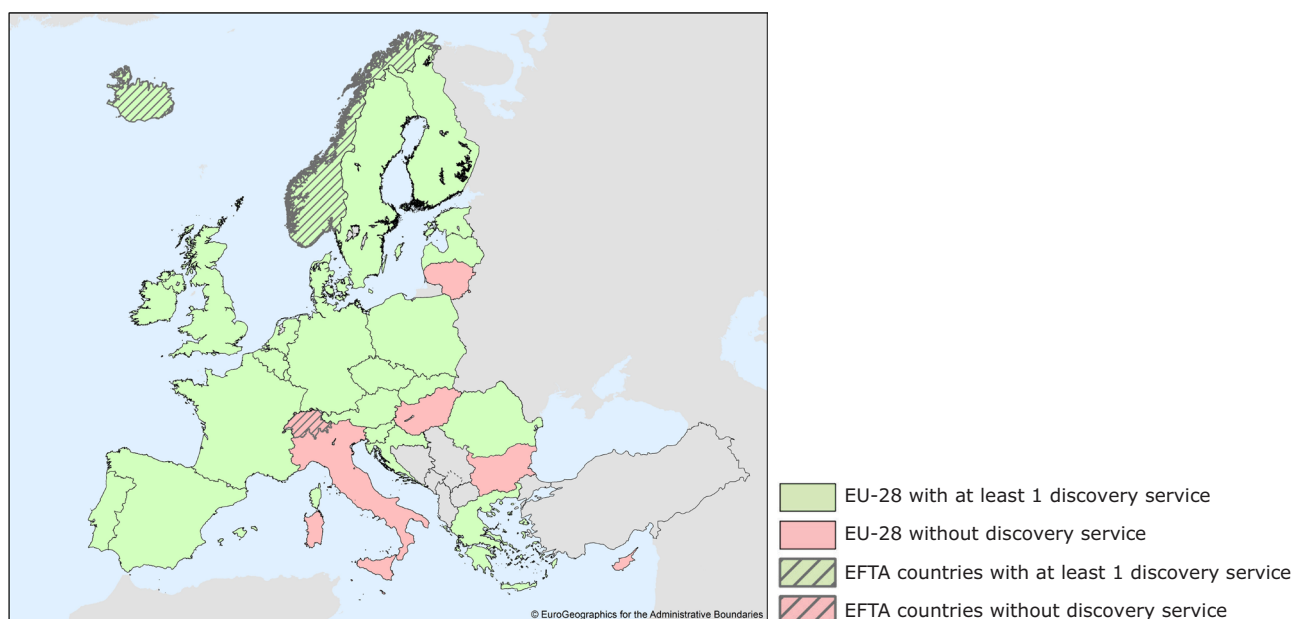
content of these access points, typically national or regional geoportals, can therefore be very different from what is accessible through the INSPIRE geo-portal. Indeed, it is often the case that these access points offer access to more than just INSPIRE metadata and data sets.

Since November 2010 the Commission has been operating a pilot version of the INSPIRE geo-portal while in parallel pursuing the development of the operational version developed by an industrial consortium. This operational version is scheduled to replace the pilot version in 2015. As of March the situation for the EU-28, EFTA and EU candidate countries that have registered their national or regional INSPIRE discovery services to the INSPIRE geo-portal is summarised in Figure 4.3.

Figure 4.3 shows that most countries have connected at least one discovery service to the INSPIRE geo-portal except Bulgaria, Cyprus, Hungary, Italy, Lithuania and Malta.

In addition to the INSPIRE geo-portal, the Commission provides an online metadata editor and the proof-of-concept of an interactive validation service, both aimed at supporting the Member States in creating and testing metadata that is in accordance with the technical guidelines that accompany the INSPIRE implementing rules. This support is augmented by extensive and detailed validation reports that are produced after every harvesting cycle of a Member State's discovery

Map 4.1 Status of registered discovery services to the INSPIRE geo-portal, July 2014



service (on average, twice per week). A discussion on a more formal approach to conformance testing and validation is taking place in the context of the MIF work programme.

The public consultation indicates that relatively few respondents (31 %) used the INSPIRE geo-portal, whilst national and regional geoportals were much more popular (77 %). This is to be expected as most users look primarily for data about their own country. As more harmonised data sets will become available through the implementation of INSPIRE supporting cross-border applications it is likely that the use of the INSPIRE geo-portal will also increase. It must also be acknowledged that

in the consultation the 'other' geoportals cover a wide range of applications, including national and regional geoportals, community specific geoportals and even very generic geoportals (Google Bing, Yahoo! map services, etc.).

The question concerning what type of services are being used and are accessible through the INSPIRE geo-portal shows a picture that is largely in line with the INSPIRE roadmap, with a larger positive result for the use and accessibility of discovery and view services than for the download services (see Figure 4.4). As the legal obligation for making download services operational came about at a later stage in the roadmap, this is to be expected.

Figure 4.3 Feedback on the use of the INSPIRE geo-portal

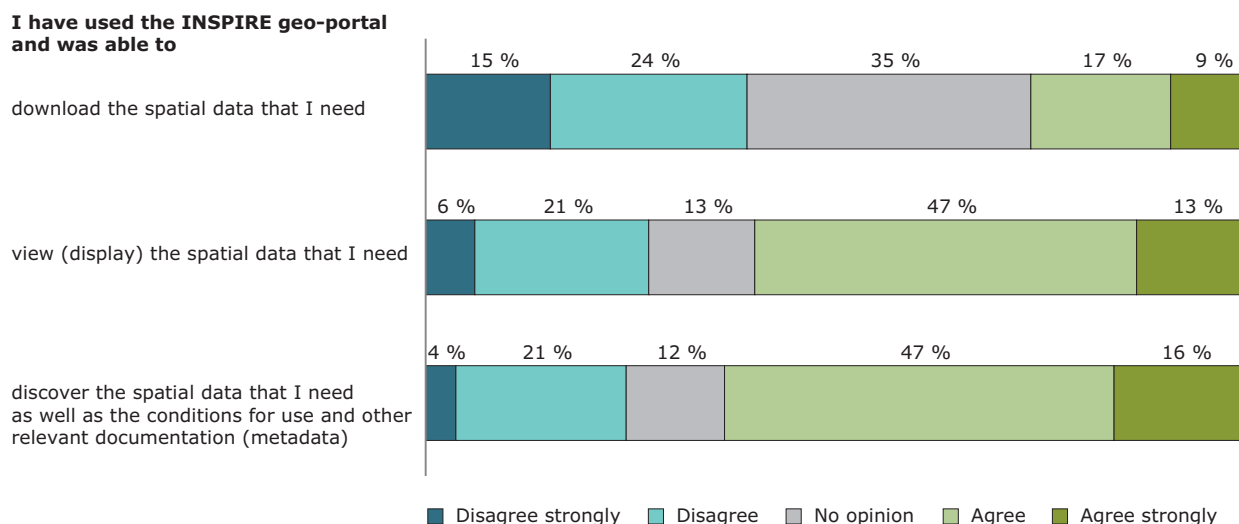
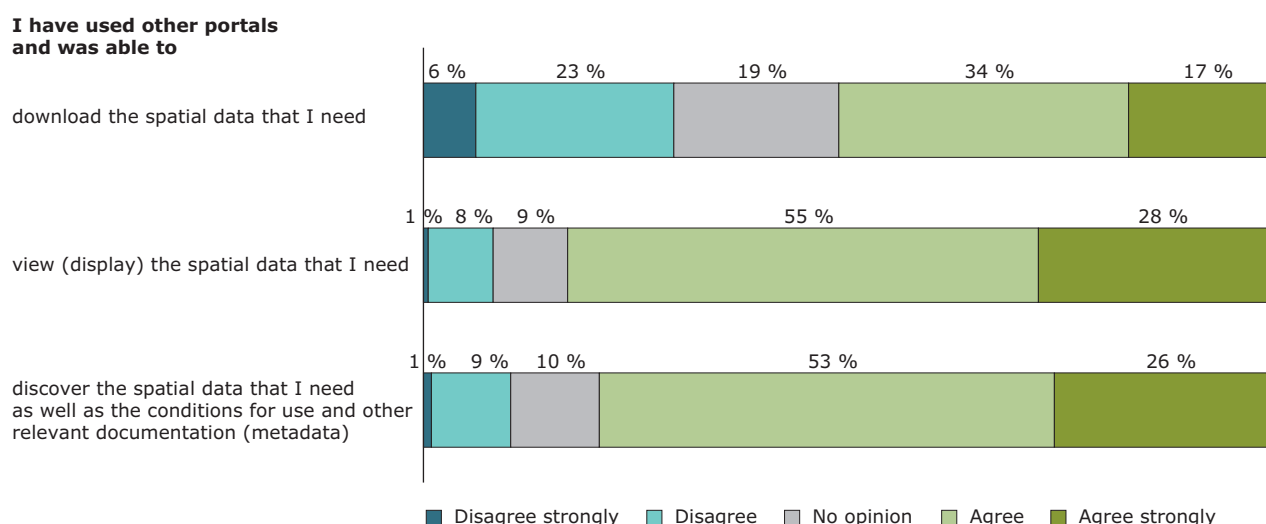


Figure 4.4 Feedback on the use of the other geoportals



A relatively important part of the responses (+/- 25 %) indicate that the spatial data needed can neither be found nor visualised through the INSPIRE geo-portal. Since the INSPIRE geo-portal harvests all metadata for discovery from the national or regional INSPIRE discovery services and offers a direct link to the Member States' INSPIRE view services, we must conclude that these data and services are not available in the spatial data infrastructures (SDIs) at regional or national levels either — or that the connections between European, national and regional SDIs have to be reinforced.

Comparing the situation with the response to the similar question for other geoportals (Figure 4.5), the overall picture that emerges looks quite similar. In this case, it is harder to attribute the negative response to the download availability of data sets to a later availability of these services and we must conclude that other obstacles are present that prevent the downloading of data. The general response on spatial data that can neither be discovered nor viewed is better as compared to the question of the INSPIRE geo-portal, indicating that the issue is not really INSPIRE-specific.

Considering the 'Yes' percentages in the two questions relating to discoverability and accessibility of spatial data (Figure 4.6), twice as many spatial data sets and services are reported to be accessible through national or regional geoportals as compared to their accessibility through the INSPIRE geo-portal. The fact that all the spatial data sets and services available at the national level in Figure 4.6 fall under the remit of the INSPIRE Directive, and

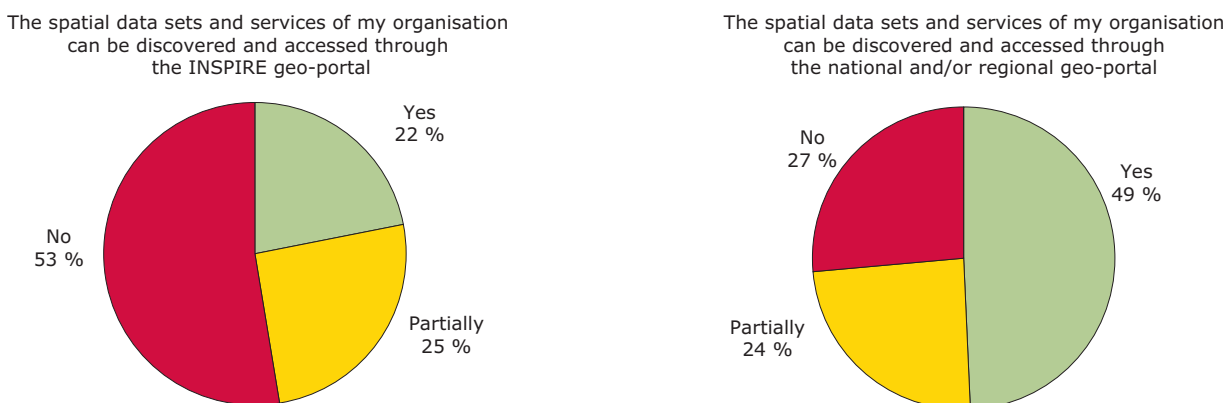
that their INSPIRE metadata are fully harvested and discoverable through the INSPIRE geo-portal, implies that there are missing links either between the national and the INSPIRE geo-portal or in the metadata of the data sets and of the services. We know that the former is the case in at least six countries that have not linked their national geoportals to the one operated by the Commission. Another issue of concern is that even at the national level, more than half of the spatial data sets and services are not discoverable and accessible through a national or sub-national geoportal.

The INSPIRE geo-portal should offer the advantage of easier cross-border searches and visualisations compared to regional or national geoportals. The feedback from the public consultation is almost evenly split on this point, with just over half of the respondents agreeing that the INSPIRE geo-portal makes it easier to find data in cross-border areas. The implementation of the implementing rules on the interoperability of spatial data sets could be a driving factor to improve this situation, as it should allow an easier combination of data sets originating from different countries.

4.3.4 Interoperability of spatial data sets and services

The process of developing INSPIRE data specifications started with the preparation of framework documents, including the Generic Conceptual Model ⁽³²⁾ and a Common Methodology ⁽³³⁾. These framework documents

Figure 4.5 Discoverability and accessibility of spatial data sets in national geoportals and in the INSPIRE geo-portal



⁽³²⁾ http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/D2.5_v3.4.pdf.

⁽³³⁾ http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.6_v3.0.pdf.

facilitated the cross-theme coherence and thus were fully utilised for the development of the data specifications for the themes of Annex I, published as technical guidelines for each theme⁽³⁴⁾. The technical guidelines then served as a basis for preparing the implementing rules that were voted by unanimity by the INSPIRE Committee in December 2009, and were adopted as Commission Regulation (EU) No 1089/2010 in November 2010. This Regulation regards the interoperability of spatial data sets and services for Annex I data themes.

The Regulation was amended twice. The first time, in February 2011, it was amended to add the definitions of code lists and their values for Annex I spatial object types and data types. The second amendment was adopted in October 2013 to add the specifications for Annexes II and III data themes and amend a few themes of Annex I to be harmonised with Annexes II and III themes. The consolidated version is now available⁽³⁵⁾.

The timetable for implementing the Regulation and its amendments has the following key dates:

- 23 November 2012 for newly collected and extensively restructured Annex I spatial data sets;
- 04 February 2013 for newly collected and extensively restructured Annex I spatial data sets (including the use of the code lists and their values);
- 21 October 2015 for newly collected and extensively restructured Annexes II and III spatial data sets;
- 23 October 2017 for other Annex I spatial data sets still in use at the date of adoption;

- 04 February 2018 for other Annex I spatial data sets still in use at the date of adoption (including the use of the code lists and their values);
- 21 October 2020 for other Annexes II and III spatial data sets still in use at the date of adoption.

As shown above, the Member States are required at the present time to comply with Regulation 1089/2010 and its amendments only for newly collected and extensively restructured Annex I spatial data sets.

The Member States are required to monitor, and report annually to the Commission, the implementation of INSPIRE in their country based on a series of indicators defined in Commission Decision 2009/442/EC of 5 June 2009 implementing the INSPIRE Directive. These indicators include the extent of the national territory covered by spatial data sets falling under Annexes I, II and III of the INSPIRE Directive, and indicators on the extent of conformance of these data sets to the specifications on interoperability. As indicated earlier the Member States are required, at the present time, to comply with Annex I specifications only for newly collected or heavily restructured data sets, while they have until 2017 for all other Annex I data sets.

Table 4.3 shows that the percentage of Annex I data sets conforming to both the Commission Regulation (EC) No 1089/2010 (ISDSSs) and the Commission Regulation (EC) No 1205/2008 (MD) is still rather low.

As shown, only three countries appear to be above 10 % conformance, with many countries not figuring at all in the table (i.e. reported '0' for this indicator) even though they were declaring to be

Table 4.3 Level of conformity of Annex I spatial data sets, 2012

Member State	Austria	Belgium	Bulgaria	Czech Republic	Denmark	Finland	Germany	Ireland	Latvia	Netherlands	Poland	Romania	Slovakia	Spain
Level of conformity % ⁽³⁶⁾	2	5	1	5	25	1	2	5	8	13	18	8	25	1

⁽³⁴⁾ <http://inspire.ec.europa.eu/index.cfm/pageid/2>.

⁽³⁵⁾ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02010R1089-20131230&qid=1400675738563&from=EN>.

⁽³⁶⁾ This percent is the number of conformant data sets divided by the total number of Annex I spatial data sets for the year 2012.

conformant with the regulation on interoperability of spatial data sets and services. Several reasons may lead to the presented discrepancy, which make those indicators not fully representative of the real status of implementation. As an example, Poland reported the implementation 'done' for the themes Geographical names, Administrative units, Addresses, Cadastral parcels and Transport networks, meaning that the related data sets were prepared in conformity with INSPIRE requirements – i.e. Commission Regulation 1089/2010 and the applicable technical guidelines. However, the requirement regarding the periodic updating of the data sets was not met and therefore the value of '0' was entered in the monitoring file.

When interpreting the values of the monitoring indicators, two aspects are to be considered:

1. The identification of relevant data sets that need to be compliant with INSPIRE implementing rules has been changing in time as a result of better understanding about the data content of the INSPIRE themes by the national authorities as well as better national coordination/knowledge of existing data sets at local, regional and national levels. In some cases, national reorganisation of data production, maintenance and provision took place (e.g. in the Netherlands), which influenced the number of reference data sets monitored and reported.
2. The conformity is expressed as yes, no or not evaluated; therefore, the indicator does not take into consideration data sets that partly conform. This explains why data sets may be rated as not conformant – '0' – without showing the real status of the implementation.

The identification of spatial data sets related to the INSPIRE themes and accompanying services by the Member States is still an ongoing process. Also, the provisions to comply with INSPIRE requirements defined as Abstract Test Suites (ATSs) in the Annex A of each technical guideline are yet to be fully understood by the Member States. This is related also to the technical guidelines of the INSPIRE Directive Annex I spatial data themes, where the ATSs were added only in April 2014. Capacity building and technical skills at the level of local government are also important areas that need to be developed further to facilitate implementation.

Although the major deadline for provision of Annex I-relevant data sets (in use) according to the implementing rules (Regulation 1089/2010) is still to come (2017), the results of the public consultation

show progress towards implementation, at least concerning the availability of metadata, and discovery and view services. In particular, 68 % of respondents in the public consultation agree that Annex I data sets are documented and discoverable via the Internet, with another 22 % agreeing only partially. These data sets are also viewable (68 %) or partially so (21 %), but download is not so common either totally (46 %) or partially (26 %). Note that half of the users find that data policy is no obstacle to data use, but the other half find that there are partial obstacles (30 %) or significant ones (20 %) (see also Section 4.3.5).

The most used Annex I data sets correspond to the INSPIRE Administrative units (68 %), Cadastral parcels (55 %), Protected sites (52 %), Transport networks (50 %) and Hydrography (49 %) data themes.

The implementation of INSPIRE for Annexes II and III data themes is at its initial stage as the corresponding specifications were published in December 2013. The deadline for full alignment of relevant data sets in current use with implementing rules is 2020 (2015 for new data sets) and therefore the evaluation of the implementation is currently impossible. However, the public consultation already shows some results, in line with what is already perceived with the last national monitoring and reporting: users reported that 62 % of data sets related to Elevation are fully documented, 66 % for Land cover, 74 % for Orthoimagery and 64 % for Geology. The ability to discover a documented data set is higher for Land cover (91 %), followed by Orthoimagery (90 %), Geology (88 %) and Elevation (86 %). The public consultation shows a relatively low response rate (30 %) for the existence of download services, and the existence of data policy obstacles as discussed in Section 4.3.5.

For Annexes II and III, both the 2014 public consultation and the reports from the Member States show that identifying which data sets should be aligned with the relevant INSPIRE theme is not always straightforward, without consulting the INSPIRE registers. To address this problem, the Commission has been operating since 2014 the INSPIRE registry, including the Feature Concept Dictionary, and the code lists necessary to more easily identify objects and types defined by INSPIRE. This service is evolving, and will hopefully make an important contribution in facilitating interoperability.

In parallel to the development of the INSPIRE data specifications on the 34 themes of Annexes I, II

and III, specialised networks were established in the Member States. As an example, in Germany the specialised networks were often coordinated on a theme-related basis by national experts who participated in the work of the INSPIRE TWGs set up by the European Commission. The TWG experts therefore had the possibility of including an extended 'network' in the development and consultation process to receive additional feedback. These specialised thematic networks (national, but also EU) can play an important role also in the implementation phase of the specifications, and in fact we see already some Annexes II and III data themes being implemented ahead of schedule. However, having said this, the poor quality of the translations of the technical terms in the Annexes II and III data themes has also been pointed to as an obstacle for the uptake in the thematic communities.

In several countries, the implementation of INSPIRE has offered an opportunity to take stock of who is responsible for what data, and initiate reorganisation aimed at reducing duplication of work, and hence leading to savings. As an example, the Netherlands in recent years has concentrated on eliminating duplications in the spatial data sets available within the state administration following the principle that data are collected once and used multiple times. Three conceptual models have been developed in the Netherlands to decide which data sets address the INSPIRE requirements and who is responsible for them. These are the basic model, the node model and the collective model. The differences among the models relate mainly to the extent to which cooperation between INSPIRE data providers is organised for each theme. The Dutch INSPIRE steering committee has opted to start with the basic model, in which each feature type in an INSPIRE theme is given shape by one Dutch data set. It is expected that this approach will be the quickest to produce a good result and that the other data sets will follow in its tracks.

As of 21 April 2014, the INSPIRE geo-portal provided information on just over 282 000 metadata records for spatial data sets and services, of which almost half (110 000) referred to Orthoimagery for Poland, which provided one metadata record for each tile of imagery rather than one for each data series. In other instances, decisions on the granularity of documentation may also be influenced by the institutional structure of the country. For example, Spain has documented over 8 000 data sets referring to Addresses, compared to

the 18 in the United Kingdom, 25 in France and 84 in Germany. These examples show that it is difficult to compare the implementation of INSPIRE in different countries purely on the number of data sets and services documented. Having said that, the very low number of spatial data sets and services documented in some countries (less than 40 in Estonia, Greece, Ireland, Luxembourg and Slovenia) may indicate a problem with implementation. Similarly, the six countries that have not yet defined a discovery/catalogue service as an endpoint in the INSPIRE geo-portal (Bulgaria, Cyprus, Hungary, Italy, Lithuania and Malta) may have data set documents, but these are not visible from the INSPIRE geo-portal.

On the basis of these considerations, it is necessary to conclude that the implementation of INSPIRE is not consistent across all the Member States. The country differences in implementation are influenced by several factors, including the level of effectiveness and communication of INSPIRE organisation structures. This observation is supported by the public consultation where the problem of national coordination has been identified as the second biggest obstacle encountered by the stakeholders, after the technical complexity of INSPIRE (See Section 7.2.6).

In order to promote consistent implementation of the INSPIRE data specifications, the Commission is organising what it calls Thematic Clusters⁽³⁷⁾. The aim of the Thematic Clusters — which are part of the MIF — is to foster the evolution of INSPIRE and help embed it in technical practices within a range of communities. The proposed clusters are based on similarities of issues and data providers, links between data sets and experience from the development phase of the INSPIRE data specifications.

4.3.5 Spatial data and services sharing

Agreements on sharing, access and use are among the main components of an infrastructure for spatial information.

The INSPIRE Directive requires that the measures for the sharing of the spatial data sets and services facilitate the sharing between public authorities (Art. 17) and make the network of services available to both the public (Art. 11) and the public authorities (Art. 17).

⁽³⁷⁾ Call for Facilitators — Thematic Clusters— <http://inspire.ec.europa.eu/index.cfm/newsid/11586>.

The INSPIRE Directive measures for sharing are different for public authorities and for the public.

For public authorities: Member States have to make arrangements to allow sharing of spatial data sets and services amongst public authorities across all levels of government in the EU as well as bodies established by international agreements that the EU and Member States are parties of. This facilitates access to spatial data and services, and enables their exchange and use for the purposes of public tasks that may have an impact on the environment without restrictions likely to create practical obstacles at the point of use.

For the public: Member States have to implement easy-to-use services to discover, view and download spatial data (complemented with services for spatial data transformation and for invoking other spatial data services). Member States shall also provide access to these services through the INSPIRE geo-portal established by the Commission at the EU level and may also provide access to those services through their own access points.

Use of spatial data sets and services within the context of INSPIRE therefore addresses two types of users:

- public use of services (Art. 11);
- use of spatial data and services for the purposes of public tasks that may have an impact on the environment, by public authorities, and Community institutions and bodies established by international agreements that the Community and Member States are parties of (Art. 17).

By way of derogation, Member States may limit public access to the services in specific cases according to Art. 13(1), with exception for services providing access to information on emissions into the environment.

By way of derogation, Member States may limit sharing with public authorities, and Community institutions and bodies established by international agreements in which the Community and Member States are parties, only in specific cases when this would compromise the course of justice, public security, national defence or international relations. Hence, several of the possible derogations in Art. 13(1) that may be applied for sharing with the

public do not apply for the sharing between public authorities. However, when spatial data or services are shared with public authorities, there may be arrangements with requirements under national law conditioning their use.

These measures were required to be in force from 15 May 2009. Whilst the technical measures required by the directive have a phased implementation and have only recently come into force (see Figure 2.2 in Section 2.4), or have yet to reach that stage (see Section 4.3.4), in the case of data sharing agreements between public administrations, there should already be five years' experience in implementation.

Based on INSPIRE country reports 2012, it is evident that the Member States are adopting heterogeneous measures to arrange the spatial data and service sharing between public authorities. Measures are adopted at several levels: at national (state) level, at the level of sub/national governments or at the level of the individual public authority that is a data provider. Table 4.4 ⁽³⁸⁾ summarises the range of approaches reported by the Member States.

Several countries are implementing general measures for spatial data and service sharing, providing easier access and use of spatial data sets and services to broader public authorities or other users. Among the general measures are, for example, the following approaches:

- Adopting legislative frameworks (43 %). For example, Finland, France, Germany, Ireland, Latvia, Lithuania, Luxembourg, Spain, and Sweden.
- Combining (or preparing initiatives for) data policy on spatial data and service sharing with other high-level governmental activities and strategic documents that usually cover the wider governmental or public sector and are often connected with other digitalisation, information society and eGovernment initiatives (25 %). Examples include Denmark, Finland, Ireland and Sweden, as well as some initiatives and policies in preparation in Cyprus, the Czech Republic and Greece.
- Adopting general licensing frameworks (25 %), with examples from France, Ireland, the Netherlands, Sweden and the United Kingdom.

⁽³⁸⁾ Based on the analysis of the INSPIRE country reports, 2012.

- Adopting or preparing the basis for Open Data policies (32 %), with examples from Austria, Denmark, Finland, France, Germany, Ireland, the Netherlands, Spain, and the United Kingdom.

Those approaches include certain levels of harmonisation of conditions for access and use of data and services, and provide common agreements to wider users, stating in many cases that this approach reduces the management costs of the agreements. In the current stage of the INSPIRE Directive implementation, the main focus is on sharing and providing access to the basic (reference) spatial data sets, for example: topographic maps, geographical names, addresses, orthoimagery.

A more common practice, used in more than half of the Member States, is the use of the overall sharing arrangements, when a public authority shares its data and services with several other public authorities of different levels of public administration. Such arrangements are used for example in Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, France, Germany, Iceland, Latvia, Lithuania, Poland, Portugal, the Slovak Republic, Spain and the United Kingdom.

Whilst the arrangements above, and in particular the general measures, are a step forward, Table 4.4 shows that more than half (54 %) of the cases include the use of individual arrangements between the public authorities (for example, Austria, Belgium, Bulgaria, the Czech Republic, Estonia, Hungary, Lithuania, Malta, Romania, the Slovak Republic and Slovenia). When this approach is the only measure

taken, it is very likely that it could cause obstacles as agreements are concluded with several public authorities, each one providing different conditions for access, exchange and use (for example, in cross-border cases).

The general opinion from the public consultation is that INSPIRE contributes to a more open policy for the public sector with 83 % of positive replies (out of 698 replies). Nevertheless, more than 50 % of respondents find that data policy is still an obstacle (totally or partially) for all three Annexes covered by the directive. Respondents from data-producing organisations indicated that only 53 % of their organisations had policies in place to support the data sharing requirements of INSPIRE (see Figure 4.7).

There is some variation in the user perspective depending on the data theme. As a general point, Annex I themes seem to have fewer problems than Annexes II and III, but the differences are not very large, as shown in Table 4.5. There are also small differences by data theme: In Annex I, the proportion of users perceiving that there are no data policy problems to data access range from 59 % for Protected sites to 45 % for Cadastral parcels and Transport networks (interestingly, even Coordinate reference systems and Geographical grids have half or more of the respondents perceiving that data policy is an obstacle at least partially to use of these data themes). For Annex II, the proportion perceiving that there are no data policy obstacles to data use range from 48 % for Geology to 41 % for Elevation, while for Annex III it ranges from 56 % for

Table 4.4 Type of sharing arrangements in the countries

Type of sharing arrangements	Number of countries	%
Legal framework is adopted and defines general conditions for data and service sharing (not necessarily only for INSPIRE)	12	43 %
Data policy related to spatial data sets and services is included in the strategic documents (adopted or under development)	7	25 %
Licensing frameworks are adopted or implemented (or going to be implemented)	7	25 %
Common sharing models and structures are adopted or implemented (or going to be implemented)	4	14 %
Open Data policy (licence) is adopted or activities to open governmental data are in place	9	32 %
Overall arrangements for sharing of data and services between one organisation to different levels of public administration	16	57 %
Specific arrangements between fixed organisations as bilateral or multilateral agreements	15	54 %
Legal basis is applicable to a specific organisation and governs the data and service sharing to other partners	6	21 %

Table 4.5 Average responses to the 2014 public consultation by perceived obstacles to data use from the user experience (%)

Average responses by INSPIRE Annexes of spatial data themes			
	Obstacles exist	Obstacles exist partially	No obstacles
Annex I	21 %	30 %	50 %
Annex II	22 %	33 %	45 %
Annex III	19 %	40 %	41 %
All annexes	20 %	37 %	44 %

Bio-geographical regions to 30 % for Agricultural and aquaculture facilities.

Taking all this feedback into consideration and considering that five years have already elapsed since these sharing measures were supposed to be in place, this outcome is not satisfactory and needs remedial action.

There are several initiatives and programmes at international, European and Members States' levels to open up government data for further use with no or with low restrictions, in particular for public tasks. Such initiatives are, for example: Open Knowledge Foundation (39), European Union Open Data Portal (40), Open Access in Horizon 2020 (41), Digital Agenda for Europe (DAE) (42) and Directive 2003/98/EC of the European parliament and of the council of 17 November 2003 on the re-use of public sector information (hereafter referred to as the PSI Directive). Hopefully they will have a beneficial effect in removing some of the existing policy barriers identified above.

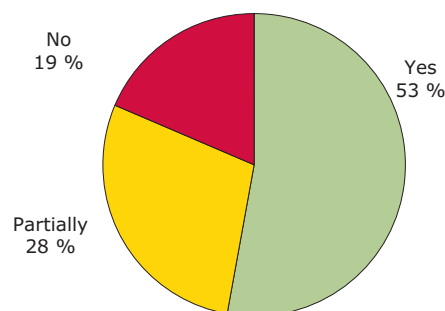
The definition and standardisation of Open Data is not mature yet, leading to heterogeneity of Open Data licensing models. For example, the Open Knowledge Foundation defines work (spatial data sets and services should be related to this term) as 'open' if it satisfies the specified conditions of access, redistribution, reuse, absence of technological restriction, attribution, integrity, discrimination and license — in other words, work is open if it can be freely used, reused and redistributed by anyone. Although any institution or organisation may produce open data, an emphasis is placed on

publishing information from public authorities, usually presented as Open Government Data (43).

One of the well-known and used open licensing models is Creative Commons, which provides free, easy-to-use copyright licenses and a simple, standardised way to give the public permission to share and use the creative work — on condition of the author's choice (44), Creative Commons licences are used or are a basis for another licensing model by some of the Members States for the spatial data sets and services related to INSPIRE. Open Data policy for spatial data sets and services has been implemented in Denmark, Finland, Germany (45), Iceland, the Netherlands, Spain and the United Kingdom (46).

Figure 4.6 Data producer respondents to the 2014 public consultation by existence of data sharing policy towards public administrations

My organisation has a data policy which allows public authority organisations in my country to access and use its spatial data and services without restrictions likely to create practical obstacles for their use



(39) <https://okfn.org>.

(40) <http://open-data.europa.eu/en/data>.

(41) <http://ec.europa.eu/research/science-society>.

(42) <http://ec.europa.eu/digital-agenda>.

(43) <http://www.deri.ie/content/open-data-overview>.

(44) <http://creativecommons.org>.

(45) INSPIRE Conference 2013; A Comparative Analysis of Open Government Data Initiatives in Europe; Open and free INSPIRE-relevant spatial data in Germany.

(46) Open Government Licence (<http://www.nationalarchives.gov.uk/doc/open-government-licence/version/2/>).

It is worth noting that whilst the vast majority (83 %) of the respondents to the public consultation agree that INSPIRE has contributed to a more open data policy in their country for public sector data, there is a need to leverage this wider Open Data environment to also overcome barriers still existing for INSPIRE-related data. In addition to the data policy area, it is necessary to concentrate on several other areas that are causing barriers to data and service sharing, as explained in Table 4.6, such as legal, technical or financial.

The INSPIRE Directive is specific in requiring that sharing arrangements be open to the public authorities of other Member States and to the institutions and bodies of the Community (Art. 17(4)) and to the bodies established by the international agreements based on a reciprocal and equivalent basis for the purposes of tasks that may have an impact on the environment (Art. 17(5)).

The replies from the 2014 public consultation from data producers indicate that 67 % of the data policies of the organisations allow the access, exchange and use of spatial data sets and services to the public authorities of other Member States. They also allow access to the Community institutions and bodies and to the bodies established by international agreements on the same terms as for the public authorities within the countries, while 29 % of replies indicate that the data policies are only partially open. This appears to be a positive result, but needs to be seen in the context of Figure 4.7 showing that only a little more than half of the organisations (53 %) had a policy allowing access with no restrictions at the point of use. Therefore, the terms are the same but the barriers are still present in many circumstances (see Sections 7.2.3 and 7.2.10).

Access of the Community institutions and bodies to the spatial data sets and services in the Member States should be provided under harmonised conditions that are governed by Art. 17(8) and in details by the Commission Regulation (EU) No 268/2010 (Regulation on INSPIRE DSS) ⁽⁴⁷⁾. The provisions of this Regulation, adopted in March 2010, were supposed to come into force by the end of 2011, with a transition period of up to three years for the arrangements already in place at the time of entry into force of the regulation.

The reports from the Member States indicate that 54 % of the countries consider Community institutions and bodies at the same level of national (state) public authorities. Therefore, the same types of sharing arrangements will apply. However, only 21 % of the countries indicate that they have been using the regulation on INSPIRE DSS to define the procedures and provide the templates for access to the spatial data sets and services according to this regulation. In addition, there is almost no information if such arrangements between the public authorities in the Member States and Community institutions and bodies have been concluded and therefore tested in practical use. This is contrary to the active sharing practice between the public authorities within the countries.

The reports from the Member States also indicate that the majority of countries (86 %) are aware of barriers and difficulties of a different nature that are related to data and service sharing. They have provided a list of 145 issues as barriers affecting data and service sharing. These obstacles are diverse from country to country. The most common types of obstacles are shown in Table 4.6. The table shows the obstacles are not just related to data and service policy issues (22.8 %) but cover a wider range of other issues such as technical (29.7 %), organisational (11 %), and financial (11 %) that need to be addressed to achieve the required progress.

Moreover, the experiences from the European project GISC ⁽⁴⁸⁾ show big differences between countries in providing access to the spatial data sets and services with respect to the conditions for their use, different authorities to contact in each Member States to set up agreements, and different types of the agreements used. This indicates that obstacles are still present and need to be monitored and acted upon.

⁽⁴⁷⁾ <http://inspire.ec.europa.eu/index.cfm/pageid/62>.

⁽⁴⁸⁾ <http://gisc.ew.eea.europa.eu>.

Table 4.6 Common types of obstacles to data sharing identified by Member States

Type of barriers	Number of issues	%	Category
Legal barriers, lack of strategic policies, low usability and added value (for specific users or cases)	18	12.4 %	Legal
Diversity of existing information systems, duplication of data resources, difficult change to new technology	10	6.9 %	Technical (29.6 %)
Additional (specific) technical and infrastructure resources are required, lack of appropriate tools	18	12.4 %	
Quality of data, metadata and services	7	4.8 %	
Level of standardisation, clarity of technical documentation is still low, high complexity of services and data specifications	8	5.5 %	
Lack of human resources, capacity and knowledge	19	13.1 %	Knowledge
Additional financial resources are required/high financial demands, difficult financial planning	16	11.0 %	Financial
Low cooperation between institutions and organisations, administrative and organisational barriers, lengthy procedures, bureaucracy	16	11.0 %	Cooperation and organisation
Heterogeneous licensing models and sharing arrangements (or lack of those); modernisation	6	4.1 %	Licencing and sharing (22.7 %)
Restrictions are applied: charges and conditions for access and use (different user types, different conditions, etc.)	20	13.8 %	
Specific issues: resistance to open data, responsibility for use, protection of personal information	7	4.8 %	

4.3.6 Monitoring and reporting

Article 21 of the INSPIRE Directive foresees that 'Member States shall monitor the implementation and use of their infrastructures for spatial information. They shall make the results of this monitoring accessible to the Commission and to the public on a permanent basis'.

This monitoring takes place on a yearly basis and is complemented by three-yearly reports (see Section 3.1). Commission Decision 2009/442/EC of 5 June 2009 implementing the INSPIRE Directive ⁽⁴⁹⁾ and associated guidelines detail the indicators that the Member States need to provide for monitoring the implementation of the directive and the way to calculate them. A specific template in the form of an Excel file as well as an XML (Extensible Markup Language) schema have been made available to that effect by the European Commission.

Almost all Member States have provided monitoring information yearly since 2010 and reports in 2010

and 2013. During the first years of monitoring, Member States have been collecting the information required through distribution of Excel sheets to the data providers they identified for the various data themes. Some countries have then set up online tools to ease the collection of such information, while others have decided to move towards an almost fully automated monitoring system based mainly on the content of their national catalogue. In the latter case, the assumption is made that nearly all identifiable data sets related to INSPIRE have been already referenced in the national catalogue and the metadata on data sets or services are complemented with ancillary data as needed by the various indicators.

Most general indicators are expressed as ratios between the number of metadata, data sets or services meeting specific criteria and the total number of data sets or services reported. In addition, specific indicators have been defined for each annex to provide a more detailed view on the structure of the general indicator they relate to.

⁽⁴⁹⁾ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:148:0018:0026:EN:PDF>.

⁽⁴²⁾ <https://ies-svn.jrc.ec.europa.eu/issues/2138>.

A workshop on monitoring was organised by the European Commission and the EEA for INSPIRE NCPs and INSPIRE reporters in October 2013. Although the need to monitor the implementation and use of the infrastructures for spatial information has not been questioned, the participants have expressed their wish to see the usefulness and the reliability of the monitoring information improve. Furthermore, serious concerns have been expressed about the relevance and reliability of specific indicators, such as monitoring of the geographical coverage of spatial data sets, which is laborious to calculate and is not regarded as providing any valuable information on the implementation of the directive. Other indicators also need to be reviewed, such as those monitoring the use of network services (NSi3) as few service providers have the data necessary for this indicator.

As regards the usability of the indicators for monitoring by Member States of the implementation and use of their infrastructures for spatial information (INSPIRE Directive, Art. 21), their value resides in the trends that can be derived for each of them and for each Member State over the years since 2010. However, trends can be difficult to extract as the Member States review and consolidate the organisation of their data holdings as a result of INSPIRE, thus reducing duplication and increasing efficiency. This consolidation may result in a reduction in the number of data sets and services reported, and thus reflect a deceptive trend over time. In this regard, a technical working group 'MIWP-16⁽⁵⁰⁾' under the INSPIRE MIF was established. This working group addresses the need to improve the usefulness and the reliability of monitoring information.

With respect to reporting, the variability of content, depth and quality of the three-yearly reports has already been mentioned in Section 3.1. Further limitations are reported in the next section.

4.4 Use of the infrastructure

As indicated in Section 1.2, one of the questions to be addressed by this evaluation is the extent of 'use of the infrastructure for spatial information, in general and by public authorities in particular; examples of cross border use and efforts made to improve it'.

This is a particularly difficult question to address because there are no agreed metrics on how to

measure 'use'. Section 4.3.2 of this report analysed the use of the network services, which is one of the possible metrics, indicating that on average the services received close to 1 million requests per year, but with only nine countries receiving 1 million or more requests per year. Moreover, as indicated in Section 4.3.6, this indicator is one of those Member States find considerable difficult in providing, due to lack of information from many providers.

It is indeed questionable whether a quantitative measure of use is the right measure to consider. INSPIRE has been established to support environmental policies and policies that affect the environment. A true measure of use would therefore be the extent to which the use of the infrastructure has achieved these key objectives. Unfortunately, the reports from the Member States do not provide sufficient evidence to date on this subject, focusing more narrowly on the technical measures of implementation. This is an area that needs to be improved in the future. A measure related to the extent of use is the degree of usefulness. In this respect, the evidence available is presented in Section 4.5 on Costs and benefits. With respect to the examples of cross-border use, Table 4.7 shows some examples of cross-border initiatives and projects fostered by INSPIRE. Further editions of the 3-yearly reports from the Member States need to pay more attention to this important measure of INSPIRE use.

⁽⁵⁰⁾ <https://ies-svn.jrc.ec.europa.eu/issues/2138>.

Table 4.7 Examples of cross-border projects and initiatives

Countries/authorities	Initiative	Outcome
Belgium, Germany, Netherlands, United Kingdom	Safety, Mobility, Sustainability Powered by INSPIRE Conference, March 2013.	41 presentations and showcases (http://www.poweredbyinspire.eu/).
Germany (Baden-Württemberg, Bavaria) Austria and Switzerland	Prototype transformation of spatial data under INSPIRE in the cross-border region of Lake Constance, 2010.	Deriving homogeneous INSPIRE-compliant spatial data sets and services from their basic spatial data. Themes of Annex I used: Administrative units, Cadastral parcels, Geographical names, Addresses, Transport networks and Hydrography.
Netherlands, Germany	Joint Netherlands and German service derived and offered for a corresponding planning basis for joint projects, 2012.	This service was recently extended by the view service produced jointly by the federal government and Länder, WebAtlasDE.
Netherlands, Belgium	Combating cross-border crime and INSPIRE: by mapping reported activities, not only the nature and scale of the criminal activities can be clarified, but also the patterns.	Added value of INSPIRE data lies in making accessible the basic data of both the Netherlands and Flanders. This refers to data on administrative areas, geographical names, roads, addresses and aerial photos.
Denmark, Germany, Netherlands	Monitoring the Wadden Sea (international wetland).	Theme: Protected sites, but also data of themes such as Oceanographic geographical features, Bio-geographical regions, Habitats and biotopes contain a great deal of information about the ecology in the region; whereas the data made available in themes such as Population distribution— demography, Agriculture and aquaculture facilities and Production and industrial facilities help when mapping the human activities.
Czech Republic, Poland, Slovak Republic	Thematic websites developed by the Tatra National Park and Karkonosze National Park jointly with Czech and Slovak partners.	Sharing and joint creation of the spatial data infrastructure on protected sites.
Czech Republic, Poland, Slovak Republic	Annual meetings on land surveying services.	The entire agenda was dedicated to the progress of work (experience sharing) on INSPIRE.
Romania, Bulgaria	Project on 'Common strategy for sustainable territorial development of the cross-border area'. It will be integrated in the Danube Strategy.	Romania and Bulgaria data sets conform with INSPIRE for several themes, in particular Land cover, Land use, Transport networks, Hydrography, using INSPIRE registers, in a spatial data system and geoportal, able to be used for several applications.
EEA, Member States, European Commission	INSPIRE AQ e-Reporting pilot.	(http://www.eionet.europa.eu/aqportal) Software, schemas and guidelines for INSPIRE-based e-Reporting of air quality information. Input to MIF for update of INSPIRE download service TG.

4.5 Estimated costs and benefits

4.5.1 INSPIRE Extended Impact Assessment

The proposal for the INSPIRE Directive was one of the first pieces of legislation to be subject to an Extended Impact Assessment (XIA) in 2003–2004 ahead of adoption by the European Commission. The XIA was undertaken in two steps: a first document was produced in 2003 by a working group with representatives of the Member States supported by an external contractor (INSPIRE Framework Definition Support WG and Craglia, 2003). This document took note of the lack of published evidence on the social, environmental and economic costs and benefits of SDIs similar to those proposed by INSPIRE, and made therefore a set of explicit assumptions on the likely costs and benefits of INSPIRE. These assumptions included the number of organisations likely to be involved in the implementation of the directive, the time and effort it would take to create metadata, to set up services and for the harmonisation of the data sets, and the average monthly costs needed to undertake these activities. Some of these assumptions were revised in 2004 (Dufourmont, 2004) following a public consultation, with additional evidence coming from some Member States, and a revised phasing of the proposals.

The XIAs considered five policy options to address the initial problems that were the focus of INSPIRE (see Chapter 1). These options were:

1. do nothing;
2. voluntary cooperation among Member States;
3. a broad framework backed by an EU framework directive based on the subsidiarity principle of devolved management to the Member State level where obstacles are addressed in a step-by-step manner;
4. a comprehensive framework backed by an EU framework directive addressing all obstacles in a comprehensive manner;
5. EU regulation stipulating how Member States should implement INSPIRE standards and infrastructure.

Option 1 described the baseline against which the other options were assessed. From the analysis of past progress and current trends, this option concluded that policymaking would still strive to be more integrated and sustainable but, without

INSPIRE, the underpinning information base would remain patchy in coverage and variable in quality. Islands of interoperability would be established and it would remain difficult to find the requisite data for lack of an organised structure in which to search for information and because the documentation of data sets (MD) would be variable. Moreover, even when users found data, they would be unable to access or integrate them easily because the overarching architecture at the technological, organisational and procedural levels would be missing or applied inconsistently.

Option 2 was discarded at an early stage, as policy measures on awareness raising and voluntary coordination had been tried before, but had proved incapable of overcoming the obstacles to be addressed.

Option 3 was the recommended option and included a coherent set of measures consistent with measures taken elsewhere in the world where infrastructures for spatial information were set up and that addressed some of the key obstacles to the use of spatial data in Europe.

Option 4 added to Option 3 measures to address data gaps (i.e. envisaged new data collections), while Option 5, by taking the form of a regulation, provided greater harmonisation but was perceived to be ill-suited to take into account the variety of practice already existing in the EU with respect to SDIs, and would therefore impose far greater costs than Option 3. For these reasons, both Options 4 and 5 were not considered in the XIA, which evaluated instead Option 3 against a 'Do Nothing Scenario' (Option 1).

The key assumptions made at the time of the XIA included:

Number of organisations involved: in the EU-25 (as it was then) there were over 100 000 local authorities, mostly with fewer than 1 000 inhabitants. It was assumed at the time that not all of them would be involved in implementing INSPIRE directly, and that there would be a process of clustering so that higher-level authorities (regions, provinces) would provide the necessary services for the smaller municipalities, while larger cities and metropolitan areas would contribute directly. Under these assumptions, there would be only some 1 700 local entities involved (1 200 at NUTS 3 level and 450 cities), that is one every 250 000 to 300 000 inhabitants.

On data harmonisation: Here, the only evidence available came from the OGC that had participated in a process to harmonise the road database across the United States. On that evidence, it was assumed that in Europe the complexity of the problems would require an evolutionary process focusing on generic specifications because detailed applications fall under other legislation (e.g. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy – hereafter referred to as the Water Framework Directive, or WFD). It was further assumed at the time that the INSPIRE themes would be grouped in six super themes having similar properties, and each would require a harmonisation project in 18-month cycles over a 10-year period.

On metadata: At the national level, mapping, cadastral, geology and environmental agencies hold most data of relevance related to INSPIRE themes. It was assumed that each organisation already had some metadata, and that it would need 2-to-3 people full time for one year to update them based on an INSPIRE profile equal to 250-to-300 people (in the EU-25). At the local level, it was assumed that there were little or no metadata so the need here was much greater, and that for each of the 1 700 organisations involved (see earlier assumption) there would be a need for 2 people full time, for metadata creation plus 10 % per annum for maintenance and building capacity in data documentation.

Coordination costs: These were assumed to include coordination activities but also the setting up of portals and services, for data discovery, view and access. Based on European and international experience, it was assumed that at the European level there would be some 30 people involved in

these activities, at the national level 2-to-3 full-time equivalent (FTE) for small countries and up to 10 for larger ones, while at the local level there would be 0.5 to 1 FTE.

Based on these assumptions, and an average staff cost per annum of EUR 40 000, the total investments estimated for implementing INSPIRE are reported in Table 4.8. As shown, the investment required was assumed to be on the order of EUR 100 million per year, with over half of this falling at the sub-national level.

With respect to benefits, the only solid piece of evidence was a survey commissioned by DG ENV in 2002 among 50 practitioners in Europe undertaking Environmental Impact Assessments (EIAs) and Strategic Environmental Assessments (SEAs) (Vanderhaegen and Muro, 2005). This study showed that across the EU some 20 000 EIAs and SEAs were undertaken each year, with an average cost of EUR 75 000 each, taking an average of six months to complete. The survey showed that practitioners spent on average 8–10 % of the time to find and integrate the data needed to support these studies. With this in mind, if INSPIRE could eliminate these costs it would save EUR 100–200 million each year. This means that this application of INSPIRE alone (out of the many related to environmental legislation) would cover the investments needed to set up and maintain the infrastructure.

Other benefits were estimated by extrapolating figures from individual agencies such as the Environment Agency of England and Wales, and European projects such as CORINE (the Coordination of information on the environment programme), EUROSION (European initiative for sustainable coastal erosion management) and GETIS (Geographical Energy and Transport Information

Table 4.8 Summary of investments for INSPIRE foreseen during the Extended Impact Assessment (million EUR, rounded)

INSPIRE policy measures	EU-level	National	Regional/local
Harmonisation	0.6	1.2	0.5
Metadata	0.2	1.9–2.2	33
Data Policy Framework		0.4	
Coordination and implementation, including outreach	1.1	9.6	44–88
Total investment per annum over 10 years (million EUR, rounded)	1.9	13	77–122

Table 4.9 Summary of benefits for INSPIRE foreseen during the Extended Impact Assessment

Type of benefit	Estimates (million EUR per annum)
More efficient EIAs and SEAs	60–121
More efficient environmental monitoring and assessment	64
More cost-effective expenditure on environmental protection	192
More cost-effective implementation of the environmental <i>acquis</i>	32
More effective implementation of European projects	3–8
More effective expenditure for trans-European networks	90
Reduced duplication in data collection	25–160
Improved delivery of risk prevention policies	77–256
Improved delivery of health and environment policies	224
Total (in EUR million per annum)	770–1 150

System). The assumption was that if the benefits for the environmental sectors were sufficient to justify INSPIRE, any extension to other thematic domains would add more benefits than costs as the basic infrastructure was already paid for.

The estimated benefits are shown in Table 4.9. As shown, these benefits were six-to-seven times greater than the estimated costs.

4.5.2 Verifying the initial assumptions

Following the publication of the XIA, and the adoption of the INSPIRE proposal by the European Commission, the JRC started a programme of activities to verify the assumptions made in the XIA. This programme included the following:

International Workshop on Spatial Data Infrastructures Cost-Benefit/Return on Investment (Craglia and Novak, 2006). This workshop, organised by JRC with the US Federal Geographic Data Committee, and Natural Resources Canada confirmed that there was no magic methodology out there to assess SDIs, and recommended putting together a portfolio of case studies over time as well as organising studies of already advanced SDIs at the sub-national level to move beyond the ex ante approaches and start verifying some of the assumptions made. Following on this last recommendation the JRC organised two regional studies, reported below.

Study on the Socio-Economic Impact of the Spatial Data Infrastructure of Catalonia (Almirall et al., 2007). This study, commissioned by the JRC to the Universitat Politècnica de Catalunya, used the methodology put forward by the eGovernment

Economics Programme (Codagnone et al., 2006) to categorise benefits into efficiency, effectiveness, and wider socio-economic or democracy benefits. The study surveyed 23 local authorities and 15 end-user organisations of the Catalan SDI and quantified the overall efficiency and effectiveness benefits into EUR 2.6 million per year, against an investment into set-up and maintenance of the infrastructure of EUR 1.5 million over a 5-year period. Moreover, important social benefits were derived by providing to the citizens and companies located in smaller towns the same Internet-based services already available in larger cities, thus narrowing the digital divide.

Study on the Socio-Economic Impact of the Spatial Data Infrastructure of Lombardy (Campagna and Craglia, 2012). This study, undertaken by the JRC in 2009, used the same methodology as the Catalanian study but focused in particular on the benefits to the private sector. The study was based on a survey of companies undertaking EIA and SEA studies for private developers, and on face-to-face interviews with a range of stakeholders in the public and private sectors. It concluded that the regional SDI was removing some 10 % of the costs for data discovery and integration to the companies involved in these studies, that is some EUR 3 million per year, against set-up costs of the infrastructure of EUR 1.4 million per annum over three years. An additional benefit in terms of governance was that through the availability of the data published in the SDI, both developers and local government could negotiate on the same knowledge base, thus increasing effectiveness.

Study on the Use of Spatial Data for the Preparation of Environmental Reports in Europe (Craglia, et al., 2010). This study repeated the original survey of EIA

and SEA practitioners commissioned by DG ENV in 2002, which was at the base of the INSPIRE XIA benefit assessment. The survey conducted in 2009 was responded to by 127 companies in 21 countries, so a much larger sample than the original survey of 50. It confirmed that the studies for EIAs and SEAs are worth EUR 1 billion per annum across Europe. The 15 % savings in time and money by the practitioners looking for spatial and environmental data are therefore worth some EUR 150 million per year, in line with the benefits estimated in the XIA.

The studies reported above are those that have provided more quantitative evidence of the costs and benefits of SDIs, but many other initiatives, studies and projects have taken place since the adoption of the directive. Among them, it is worth highlighting the eSDI-NET+ ⁽⁵¹⁾ project, which analysed some 200 regional SDIs across Europe, showing the diversity and vitality of this sub-national level largely fostered by the INSPIRE Directive.

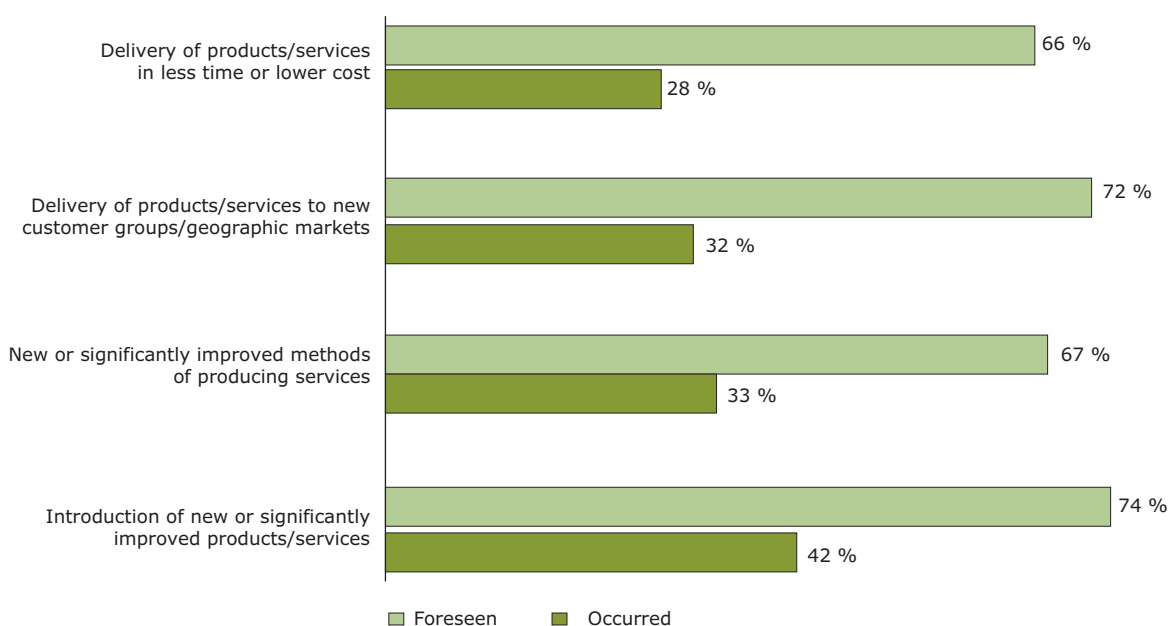
4.5.3 INSPIRE spin-offs in the private sector

With the spreading of the financial, economic and social crisis in Europe since 2009, there has been an

increasing concern to foster innovation and growth in Europe, building also on existing infrastructures for research and policy (see Innovations Union, and Digital Agenda flagships of the Europe 2020 strategy). With these considerations in mind, the SMEspire ⁽⁵²⁾ project was specifically designed to target the existing and potential spin-offs of the INSPIRE Directive among SMEs, which are the backbone of innovation and growth in Europe. Over 300 SMEs were surveyed in 12 countries and 113 face-to-face interviews held in 2012–2013 in this project. The key result is that, in general, INSPIRE has had so far a relatively low impact on Geo-ICT SMEs, though some benefits have been realised through the introduction of new products/services, ways of working and new customers/markets as well as improved turnover. However, there is a great expectation that INSPIRE will contribute to growth in the future (see Figure 4.8).

Part of the reason for the low impact is that there are many barriers to Geo-ICT involvement in INSPIRE. These include budgets, awareness and competency, and the scope of the directive. Moreover, many national infrastructures have yet to implement download and transformation services, and therefore it is still not possible to access the data to build innovative products.

Figure 4.7 Impact of INSPIRE among small and medium-sized enterprises in Europe



Source: SMEspire project.

⁽⁵¹⁾ http://www.esdinetplus.eu/about/results_so_far.html.

⁽⁵²⁾ <http://www.smespire.eu>.

The study revealed a number of interesting observations that illustrate the limitations of INSPIRE with regard to the private sector. The overall picture is that there is a good participation by the private sector in the INSPIRE implementation as contractors and service providers. However, this involvement is limited by the availability of public sector finances. A widespread and significant problem is the restricted access to public sector data either by restrictive licensing or lack of availability or publishing by public sector organisations: this significantly limits the development of value added services by the private sector.

There is a general view that INSPIRE can provide many potential benefits to the private sector. However, unless the fundamental barriers are removed, it is difficult to see how these benefits can be realised. For both private companies and public organisations, INSPIRE's main benefit is its contribution to raising awareness about geographical information in general, while underlining the need for data sharing through interoperable data and services. This should increase the availability of (harmonised and interoperable) information and the quality of data provided.

With respect to the contribution of INSPIRE to innovation, the study showed limited impact so far. To make a change, the SMEs argued that:

- there must be pragmatic solutions for SMEs to participate, through the enforcement of Open Data and eGovernment, with new business models that can be developed;
- publicly available data improves customer service and thus contributes to innovation: the more data available to organisations and people, the more demand is created for the SMEs' services and solutions;
- public authorities are asking for INSPIRE-compliant solutions, but too often calls for tenders suffer from insufficient and heterogeneous details about technical requirements for being 'INSPIRE-compliant';
- the main opportunities for the near future are seen at data and metadata levels;
- INSPIRE's impact needs to shift from 'technology' (software for serving, presenting and applying data) to 'content'; the increased availability of harmonised data for download will hopefully provide the boost expected for SMEs;

- data transformation/harmonisation can be a big challenge and business opportunity for private companies; the main concern is that data modelling activity is often 'hidden' and not fully recognised both inside and outside the organisation, so difficult to finance;
- test suites for data and web services for validation are not yet seriously taken into consideration. The biggest interest should be around download services, but these should be 'open services' for downloading 'open data'; transformation services are interesting mainly for professional and high-skilled users (again, this implies lowering constraints on use and access of data).

In summary, the SMEs have high expectations, and have seen some benefit but much more can be done to realise the full benefits and foster innovation.

4.5.4 *The view from the Member States*

The INSPIRE Directive requires a report from the Member States every three years providing a summary description of the different aspects of the implementation of the directive, including costs and benefits observed. The first report was submitted in 2010, and most countries did not report anything in the costs and benefits section largely due to the early stage of implementation and lack of detailed agreed guidelines. Following a joint workshop in 2012 in Ispra, and the agreement on some categories of costs and benefits to assess, the reports submitted in 2013 are much improved. Most countries have been able to make some assessment of the costs incurred, with difficulty in estimating the benefits, either because they were not yet visible in 2012–2013, or because their quantification is difficult.

The key finding of the 2013 report is that costs are so far in line with initial estimates and range from EUR 12–14 million per annum for large countries to EUR 5–7 million for medium ones to EUR 2–3 million for smaller ones. Some countries – e.g. the Netherlands – are reporting costs higher than expected in guidance and coordination due to the complexity of the data specifications, a concern common to many implementers.

Benefits have yet to be fully realised but are starting to emerge in terms of improved data access, better cooperation across the public sector, improved infrastructure supporting environmental policy, and better services to citizens and business. With respect to improved environmental management for

example, the Environment Agency for England and Wales estimated that the benefits of implementing INSPIRE in reducing environmental risk are equivalent to GBP 5 million ⁽⁵³⁾.

Some examples of qualitative expressions of benefits are:

The envisaged benefits of the infrastructure have indeed been realised. The spatial data cooperation has paid dividends both internally and externally, and there are also examples of increased benefits for third parties. Access to a greater volume of spatial data via the spatial data cooperation has opened the eyes of certain organisations to new possibilities and areas of application and is also contributing to better and more reliable decisions. This will ultimately lead to an improvement in the whole urban development process. The possibility of having a common and up-to-date view of a situation has increased and been made easier (Sweden).

The general public shows unexpected high interest in the geoportal, above all for the mapping portals. ... Nearly 17 000 maps are printed monthly with the mapping portals' printing function. Seen in relation with the 500 000 inhabitants of the country, this obvious popularity of the geoportal is rather stunning and proves the benefits for the citizen. ... INSPIRE has obliged the national governments to take action in the geodata domain and these obligations have helped the national geoportal to thrive and to add the European and international dimension to the original scope, which was limited to the national needs. Due to INSPIRE, a national law had to be adopted regarding geodata, and their exchange and availability. This law has inaugurated and officialised a permanent collaboration between the public instances working in the domain of metadata (Luxembourg).

The French authorities consider that the implementation of the provisions of the INSPIRE Directive do not merely represent a cost, but also an investment which is rapidly turned to account in the light of the testimonies appearing in this report. Firstly, it should be pointed out that the prime beneficiaries are the staff of the public authorities themselves. ... The gains result from the following factors: faster discovery of the data,

easier use of the data, limitation of the restrictions and reduction of the cost barriers thanks to mastering new tools and rising competence on environmental themes. The optimisation of the business exchanges between partners and the reduction in duplications of data lead to an increase in dissemination, better reuse and finally time savings for everyone. An increase in the quality of the data and their accuracy and an increase in the interest of users are also benefits found (France).

The implementation of the national spatial data infrastructure has been a goal for a long time in Finland. The implementation of the INSPIRE Directive has strengthened the support processes and set goals and timetables and along with them activated the spatial data providers. With the support of the Directive, the national spatial data infrastructure has been concretised into compatible services and the awareness of spatial data and its possibilities has clearly increased (Finland).

The development of the Danish infrastructure for spatial information is based on a legal framework, national coordination and international cooperation. Both the fundamental principles and the specific requirements in the INSPIRE Directive contribute to the basis for this infrastructure. There has been progress in the development and use of the infrastructure during the reporting period, and INSPIRE has played an important part in this. ... As the principles of INSPIRE are increasingly becoming an integral part of Danish public administration, their value is being extended across sectors. The benefits of an effective infrastructure for spatial information, including the contribution of INSPIRE, are in this regard extending out beyond public digitisation and into growth and innovation for undertakings and citizens (Denmark).

4.5.5 The view from the public consultation

In the 2014 public consultation launched to support this mid-term evaluation of the directive, several questions were asked to gauge the opinion of the respondents on the overall value and appropriateness of INSPIRE. The questions are reported in Table 4.10. As shown, most respondents feel positively about INSPIRE and its effects (Agree or Agree strongly ranging from 45 to 92 %) with

⁽⁵³⁾ <http://www.poweredbyinspire.eu/documents/0403-sustainability-carlyle.pdf>.

Table 4.10 Perceived impacts from 2014 INSPIRE public consultation

	Disagree strongly	Disagree	No opinion	Agree	Agree strongly
The objectives of INSPIRE of making spatial data and services more easily shared and used are still pertinent		2 %	6 %	35 %	57 %
The actions foreseen by INSPIRE are still appropriate to meet its objectives	1 %	12 %	21 %	47 %	19 %
INSPIRE has helped me/my organisation in becoming more efficient and effective	6 %	18 %	27 %	35 %	14 %
INSPIRE has stimulated the use of the spatial data and services	3 %	9 %	17 %	43 %	29 %
INSPIRE has improved the availability and accessibility of spatial data and services	2 %	7 %	12 %	50 %	29 %
INSPIRE makes it easier to find and use spatial data and services in cross-border areas	2 %	6 %	37 %	37 %	18 %
The benefits of INSPIRE will be greater than the costs	5 %	11 %	38 %	27 %	19 %
INSPIRE improves access to the information needed for environmental policies and decisions	2 %	5 %	22 %	48 %	23 %
INSPIRE also improves access to the information needed for other (non-environmental) policies and decisions	2 %	5 %	24 %	49 %	20 %
INSPIRE contributes to a more open policy for public sector data	1 %	4 %	11 %	51 %	32 %
INSPIRE contributes to more innovative applications and services using spatial data	2 %	6 %	18 %	45 %	28 %
INSPIRE contributes to more general eGovernment activities	2 %	5 %	22 %	48 %	22 %

No opinion around 20 %, and negative opinion from 2 to 24 %.

The most positive views are about the continued validity of the objectives of INSPIRE (92 % in favour, 2 % against), the least favourable are about the role of INSPIRE increasing efficiency or effectiveness of the respondents (49 % in favour, 24 % against). The areas of greatest uncertainty (No opinion) are not surprisingly those referring to the value of INSPIRE for cross-border applications (37 % No opinion) and benefits being greater than costs (38 % No opinion). Even for those 2 questions, however, the positive replies outnumbered the negative (55 % to 8 % and 46 % to 16 %, respectively).

Interesting findings also come from the open questions about the three biggest obstacles/challenges encountered in INSPIRE (Table 4.11), the changes proposed to achieve the INSPIRE objectives (Table 4.12), and the three biggest benefits perceived by the respondents (Table 4.13). The main obstacles are about the technical complexity of the specifications; coordination issues with a top-down approach involving only national authorities,

and almost equal third issues of communication, awareness and capacity building; and issues of the wide scope of data harmonisation. It is interesting also to look at the bottom of Table 4.11 to see which issues are not perceived to be a strong obstacle: these include level of ambition and long time for implementation, fitness for purpose (certification) for decision making, and vision/maintenance. The differences between the views of data producers and users are very marginal: this is not too surprising considering that 70 % of the respondents to the public consultation are public sector organisations, and that most are both producers and users of spatial data. An example of the issues expressed by many respondents comes from the United Kingdom:

Due to the wide scope of INSPIRE's data themes responsibility for data in-scope of INSPIRE is federated across a large number of UK local and national public authorities ... [creating] a significant challenge in engaging with these organisations to ensure they comply. Aspects of INSPIRE's implementation contributed to this challenge:

1. *Many of the UK public authorities with obligations under INSPIRE didn't have the capabilities required to publish data (skills or technology). Delays to EC guidance and the ambiguity/quality/presentation of that guidance made INSPIRE more difficult for these organisations to implement. This holds true especially in the context of the INSPIRE deadlines, bearing in mind the need for national variations in guidance to be made and for the market to deliver INSPIRE solutions.*
 2. *The technical concepts and architectural model of INSPIRE are also sometimes challenging to implement, particularly in a federated data publishing model. For example, there are consistency issues in the models: the data models are focused on features yet the Directive discusses data sets, this feature focus arguably makes data sets redundant.*
 3. *Policy joining with other Directives has been limited, this has caused some problems at Member State level and has reduced opportunities to realise benefits from INSPIRE at a UK and EC level. For example, opportunities to replace outdated Directive reporting processes through INSPIRE have been missed.*
- A complementary perspective to the one on obstacles is provided by the responses in the public consultation to the open question on the three changes proposed to achieve the INSPIRE objectives (Table 4.12). As the table shows, the three top changes proposed relate to improved communication and sharing of best practice, simplification of the technical specifications, and improved national coordination with also more support to local levels. Greater resources (financial, technical), clarity with respect to data protection issues and scope of the directive, more Open Data

Table 4.11 Main obstacles to INSPIRE implementation from 2014 INSPIRE public consultation

Categories of identified obstacles/issues	Total responses	Data users	Data producers
Technical complexity (metadata, web services, transformations, data specs, UML, bandwidth)	193	171	141
Coordination: Top-down only/national/regionals coordination — cooperation	124	105	91
Communication: Lack of awareness/capacity building/INSPIRE for managers	85	71	55
Data harmonisation/too wide scope/multi ways to implement/data identification	80	63	55
Access to data — Open Data — PSI — licensing — 3rd party IPRs — data sharing	66	55	42
Lack of human resources (IT/domain experts)	62	58	55
INSPIRE in the organisation product line/national requirements/motivation	60	50	48
Financing — EU/national/local — implementation is too costly also for maintenance	50	41	38
Quality/completeness/ usefulness of metadata/limited use of INSPIRE geo-portal	49	44	32
Use cases — demonstrations — concrete benefits	43	28	28
Senior level/political commitment	40	33	26
Constant IT/TG development — Software missing to implement/use (WFS) — procurement difficult	32	27	22
EU Directive requirements integration (reporting eGovernment, but also out of ENV)	27	23	24
International standards interactions (OGC mainly, but also International Hydrographic Organization, World Meteorological Organisation)	23	16	18
Relevance of INSPIRE, too complex, not demand- or user-based	21	14	13
Long-term vision/maintenance EU — national	15	11	10
INSPIRE data not certified for decision making/conformance/service levels	10	10	7
Ambitious roadmap/too long for implementation	7	7	6

Table 4.12 Main changes proposed to achieve INSPIRE objectives from the 2014 INSPIRE public consultation

Categories of changes proposed	Total responses	Data users	Data producers
Communication, sharing of best practices, demonstrations of benefits	84	68	60
Simplification of IRs, TGs, data models, use of INSPIRE Registry, etc. no frequent changes	82	68	58
Improve the national coordination of INSPIRE (plus support to local governments), NSDI, thematic communities, universities	74	61	51
Financial resources for the implementation (EU, national level, organisational)	61	55	50
Clarification and more precision of the data scope of INSPIRE (discovery x interoperability), protection of personal data, data quality/reliability, national data sets	54	43	37
Human resources, capacity building, trainings	53	47	44
Open Data policy — support, applications, harmonisations of licences, AAAs, download	45	35	27
INSPIRE for e-Reporting, eGovernment, other EU policy requirements (inter-sectorial collaboration)	41	37	32
INSPIRE validation/conformity tools for metadata, data, services, SLDs, persistent URIs	40	34	29
Change of internal working methods, data management, production, etc.	36	31	26
Improvement of INSPIRE geo-portal — more data!, better filters — more effective searches, better metadata, better INSPIRE website	24	21	15
Better interactions with standardisations bodies (OGC, ISO, CEN, Thematic, IT, etc.)	22	19	19
Support to Open Source software tools for implementation/testing/transformation	16	16	12
Data harmonisation (financial support, prioritisation, cross-border agreements, EU data sets)	16	11	10
Support to SMEs, private sector for new apps, services, etc.	14	13	9
More realistic INSPIRE roadmap for implementation — it is a process	14	9	8
Negative reactions (e.g. no invoke services IR, INSPIRE, not relevant)	12	10	9
Missing EU central management organisation — operational (e.g. like EEA, Eurostat, Eurocontrol)	8	5	5
Penalty for non-compliance	6	5	3
EU projects — use of INSPIRE mandatory	4	4	3

policy, and better integration with related initiatives like Open Data and e-Reporting follow in order of priority.

On the benefits side (Table 4.13), by far the largest benefits derive from better data discovery and access, which is not surprising as metadata and discovery services were the first components of INSPIRE, while the data harmonisation has yet to make its effects felt. Greater interoperability through the use of international standards are important benefits, but also improvements in internal data management processes, which is important because it gives something back to those who pay the highest

price. Again, the United Kingdom is used as an example of the benefits felt in many (but of course not all) contexts:

1. Implementation in the United Kingdom supported the growth of an Open Data culture. In particular the identification and cataloguing of data sets held by public authorities supported moves towards open government. Public bodies required to publish data under INSPIRE made other non-INSPIRE data sets open for sharing. We cannot attribute only to INSPIRE the high volume of UK data now publicly available, although it has played a significant part.

Table 4.13 Main benefits of INSPIRE implementation from 2014 INSPIRE public consultation

Categories of identified benefits	Total responses	Data users	Data producers
Better discovery/access to PSI data sets — more data available, sharing	227	194	153
Use of international GI/IT standards plus their support/data interoperability — harmonisation	131	108	97
Improved EU/national/regional coordination/collaboration among public sector organisations /among international thematic communities/public-private partnership	121	99	86
Improvement of internal data processes (description of data sets, production process, data quality, publication, etc.)	105	90	83
Business/research opportunities, innovative apps, services on cross-border, etc.	70	60	41
Knowledge transfer, GI/IT capacity building, better Governmental services	49	43	40
Better decision making/environmental or local planning problem solving/ importance of GI	47	38	35
Running/having own geoportals, web services, better self-promotion/ public sector organisation's visibility plus data stays with the providers, cost saving	44	34	33
Positive support to NSDIIs/legislation framework for GI/INSPIRE	43	34	28
Positive support to Open Data initiatives	31	29	25
No benefits yet	16	11	10

2. A noticeable benefit is the publication of previously unpublished data, notably release of property data by Land Registry. It is very popular in the data user community. Open Data User Group estimated the release of Land Registry's data would generate economic benefits up to GBP 100 million a year. The defining of Open Standards for INSPIRE has made sharing data between organisations easier. Some standards are not necessarily of wide appeal. Many standards provide a basis for interoperability between organisations.
3. Delivering INSPIRE services needs skills and capabilities that did not exist in abundance within the public sector. Geographic information was confined to desktop GIS and internal online GISs. For INSPIRE data publishers significantly developed skills and capabilities in metadata, data management, transformation and integration, and WMS. The increase in skills and capabilities is a real benefit INSPIRE is beginning to deliver. Public bodies in the UK publishing data have started using these skills and capabilities in providing other data and information related services.

4.6 Summary of state of implementation

This chapter has evaluated the current state of implementation of the INSPIRE Directive and related implementing rules at this mid-term stage of the process. The evidence is based on multiple sources as indicated in Chapter 3 of which the primary ones are the reports provided by the Member States, supplemented by a public consultation, independent studies and secondary sources.

The overall finding is that INSPIRE is being implemented across the EU (and some non-EU countries that are beyond the scope of this report) with some delay, and non-uniformity, but so far in line with expected costs and benefits. INSPIRE is starting to achieve its objectives, which according to 92 % of respondents in the public consultation are as pertinent as ever.

Although it must be recognised that major investments (and benefits) have yet to materialise, it must be equally be acknowledged that the implementation has taken place in the most difficult financial circumstances that many European countries and their public sector organisations have

faced for many decades. Some of the delays detailed below have to be put in this context. The key findings in each major component of INSPIRE are discussed below.

Transposition

- The majority of Member States have transposed the legislation with delays of one to two years.
- Domestic laws do not yet conform uniformly to INSPIRE, with some important differences also within countries.
- Most domestic laws seem to transpose correctly but arrangements for the sharing of data across public administrations show significant delays (see Section 4.3.5).

Coordination

- The participatory model for the development of INSPIRE and related implementing rules is a major area of success and needs to be built upon and maintained.
- At the EU level, more effort is needed to embed INSPIRE into environmental legislation, including reporting obligations from the Member States, and into other legislation affecting the environment.
- At the national level, greater efforts are needed to strengthen the level of participation in the INSPIRE process of sub-national and local-level stakeholders, including also measures for capacity building.
- More efforts are also needed for measures on education and training able to create the skills necessary to implement INSPIRE, particularly at the local level, and exploit the opportunities created by the achieved interoperability framework in Europe.

Metadata

- Considerable progress has been made, but so far only 77 % of Annex I, 66 % of Annex II and 39 % of Annex III data sets are documented with INSPIRE-compliant metadata. This proportion decreases to 56 % with respect to spatial data services.
- The independent study shows that only 57 % of the sample data sets analysed among those reported by the Member States could be found in the INSPIRE geo-portal.
- The average values reported above mask major variations across the EU Member States

indicating a non-uniform implementation of the directive.

- Notwithstanding the progress made in data documentation and discovery, which address one of the key objectives of INSPIRE, it is still difficult to find the data sets needed by users as some data are poorly tagged with keywords. This issue can be addressed over time if a feedback mechanism is put in place for users to report issues and fitness for purpose.
- The public consultation shows that the key problems associated with metadata are complexity of specifications and lack of tools, but that benefits are being realised with respect to clearer and more consistent documentation, greater clarity of who is responsible for what data, and less duplication.

Network services

- There is some good progress on discovery and view services, but a long way to go as well. On average, 63 % of the metadata for spatial data sets and services are available through discovery services.
- On average, 27 % of the data sets are available for view and download.
- These averages mask major differences across the EU Member States, including six countries that have not yet linked their discovery services to the INSPIRE geo-portal.
- The independent study shows that of 350 view and download services tested, 41 % could be found in the INSPIRE geo-portal and 62 % could be accessed.
- The public consultation confirmed that only about half of the respondents reported that the spatial data sets from their organisation are discoverable or viewable through web services, and less than half reported compliance with INSPIRE.
- The public consultation reported that the major barriers are about the costs of setting up web services, particularly for small organisations, and the lack of INSPIRE-customised software. Benefits start being realised by supporting a cultural change among public sector organisations of the value of documenting their assets and publishing data through web services.

Data interoperability for Annex I

- This component of INSPIRE applies at this stage only to 'new or heavily restructured data sets' in Annex I. The indicators from the Member States show very limited progress so far but can be deceptive as the percentage figures of the indicators refer to all the data sets in Annex I and not to the 'new or heavily restructured' ones.
- Some progress achieved on data documentation and view, as reported in previous sections on metadata and network services, but there are differences across countries and across data themes in the same annex. This applies also for Annexes II and III.
- The number of data sets that each country documents and makes discoverable through the INSPIRE geo-portal cannot be compared between countries as they are affected by decisions on the level of granularity documented and institutional set-up. Nevertheless, the huge variations indicate the existence of problems in some countries in implementing the directive.
- The public consultation indicates that the technical complexity of the specifications is an issue challenging implementation. On the benefits side, the implementation of the directive allows Member States and their key organisations to take stock of their data assets and introduce rationalisations of the data holdings that can produce savings.

Data sharing

- Measures to implement the directive with respect to the sharing of data among public administrations should be in place since 2009, so this should be one of the more mature areas of implementation.
- Some progress has been made, and there is a widespread view (83 % of respondents in the public consultation) that INSPIRE has contributed to a more open set of data policies in the public sector.
- Notwithstanding the progress, the reports from the Member States show that more than half of the arrangements put in place at various levels of government include bilateral negotiations with the data providers or multilateral agreements. These arrangements may require additional resources in order to conclude several different agreements with different conditions with different data providers.

- This is confirmed by the public consultation in which 50 % of users still find obstacles, in total or in part, to data sharing. Similarly, only little more than half of the respondents from data-producing organisations indicate that their organisation has a policy in place addressing the INSPIRE requirements. This may point towards the need for addressing the data sharing from two user perspectives: users from other public administrations, and users from the public.
- The reports from the Member States fail to provide adequate information on the extent to which the data sharing arrangements they have put in place are equally open to public administrations from other Member States. However, the public consultation seems to suggest that there are no discriminations between the arrangements made in a country with those made available to public administrations from other countries.
- The reports from the Member States fail to provide adequate information on the degree to which arrangements have been made for sharing data with Community institutions and bodies. Evidence from selected projects indicates a big difference across countries.
- The reports from the Member States show that existing obstacles to data sharing are not just policy related but are also technical, financial and organisational.

Monitoring and reporting

- The yearly Monitoring tables and the 3-yearly reports are the main source of evidence to evaluate the progress in the implementation of INSPIRE.
- Monitoring tables and reports have been submitted, but often with several months of delay.
- The quality of the reports varies considerably, with some being very detailed and others providing very sparse information.
- The reports tend to focus on the technical measures implementing INSPIRE and do not provide sufficient detail on the implementation of data sharing, nor of the extent to which INSPIRE is supporting the implementation of environmental policy or policies that affect the environment, which is the main goal of INSPIRE.

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- Revision is needed with respect to some of the monitoring indicators and the way they are calculated so that they are easier to collect and more robust over time.

Costs and benefits

- The evidence presented shows that the costs and benefits of implementing INSPIRE are so far in line with what was foreseen at the time of adoption.
- The major benefits to date come from the improved documentation and discovery of what spatial data sets and services are available, who is responsible and how to access them. This reflects the phasing of implementation.
- Some additional benefits arise from facilitating a process of reorganisation of data holdings at

national, sub-national and organisational levels, which increases efficiency and produces potential savings. Changes in organisational culture and contribution towards more open policies for public sector data are also important benefits mentioned.

- It must be recognised that major costs have yet to be incurred through the process of achieving the interoperability of spatial data sets for Annexes II and III.
- The technical complexity of the specifications and insufficient national coordination and communication are the main areas of concern in the public consultation.

5 Links to other environmental legislation and to environmental policies

5.1 Introduction

As the infrastructure for spatial information in the European Community, INSPIRE should assist policymaking in relation to policies and activities that may have a direct or indirect impact on the environment (INSPIRE Directive, Recital 4). As such, INSPIRE should contribute to the four major stages of the environmental policy cycle (and those of policies that need to take environmental considerations into account):

1. policy setting: to help guide policy formulation and development;
2. policy implementation: to help implement measures formulated in a policy and to monitor and evaluate the implementation of these policies against agreed targets;
3. policy assessment: to help assess the impact of existing or planned policies;
4. problem identification: to help identify the need for new policy action.

INSPIRE should contribute to the decision making of different environmental 'governance' actors involved in these policy stages at the local, regional, national and/or EU levels. Therefore, INSPIRE is to serve many users: policymakers at European and other levels, and agencies and individuals responsible for policy implementation and enforcement at European, national and regional levels. This also includes national governments and regional and local public authorities, industries and businesses that are often the target of the policies, research bodies who provide much of the scientific input to policy, specialised policy groups, non-governmental organisations and the general public in the context of public participation and policy transparency, and information providers in both the private and public sectors who deliver information products and services in support of the above users.

Decision making at these levels of governance requires information fit for purpose. The provision of the knowledge base for such decision making, irrespective of the scale at which decisions are taken, entails different steps: data collection, data management and data processing to deliver the information to the ones taking the decision.

INSPIRE's impact on spatial data management entails the delivery of well-documented and easily accessible spatial data sets (as the immediate product of monitoring, survey and other forms of spatial data capture or intermediate aggregated/ modelled spatial data products) under conditions not limiting their use for purpose. It is a key step in the information processing chain leading to the provision of information services to end users. Shortfalls in spatial data management will inevitably affect the quality of the information on which decisions are to be based.

The purpose of this section of the report is to examine the relationship between the environmental *acquis* and INSPIRE, and to assess the extent to which INSPIRE assists decision making in the environmental policy cycle. This assessment should take account of the perspective and experiences of the different levels of users — the stakeholders of the environmental governance process.

5.2 The environmental *acquis* and INSPIRE

The environmental *acquis* is the accumulated legislation, legal acts and court decisions that constitute the body of EU law related to the environment. The core of the EU's environmental legislation today consists of about 300 acts: regulations, directives, decisions and recommendations. They are joined by numerous communications and policy guidelines drawn up by the Commission.

In addition, the EU Environment Action Programmes (EAPs) ⁽⁵⁴⁾ of the last decades emphasised the integration of environment into other EU policies with many other areas of policy and legislation to be considered taking into account regional and local differences (INSPIRE Directive, Recital 2).

The information needed to support this complex interaction of policies is therefore extremely diverse, cutting across policy domains, economic sectors, and environmental media and themes. It depends upon diverse technologies and data sources, many of which are not environment-specific and managed by a wide variety of data holders from local to European levels.

Environmental issues such as the impact of air pollution on public health or the loss of biodiversity have complex cause-pathways-effect relationships. Efficient integrated policy responses to these issues can only come about if we have the capacity to find, access and combine data and information on driving forces, pressures, environmental state, and the impacts on environment, people and economy.

INSPIRE plays an important role in this process as it is meant to facilitate the access and use of the various spatial data sources relevant for integrated policy decision making at all levels of government while supporting the flow of information and data between the local, regional, national and European or international levels.

The INSPIRE spatial data scope, laid down as 34 spatial data themes in Annexes I, II and III of the directive, is cross-cutting the information and spatial data requirements of the environmental *acquis*. In fact, the 34 themes were identified by analysing the key areas of the environmental *acquis*, and determining the data required for their implementation. The list of the legislation analysed in the preparatory stages of INSPIRE can be found in the Environmental Thematic User Needs Position Paper ⁽⁵⁵⁾.

The INSPIRE data themes typically cover data sets relevant to many environmental policy areas, while on the other hand one thematic policy that is served by data could be covered by different INSPIRE data themes. For an example of the former, legislation under which the Protected sites spatial data theme included in INSPIRE are designated, includes,

inter alia: Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive), Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the Birds Directive), international conventions such as the World Heritage Convention (1975), the Ramsar Convention (1971) or specific national legislation. Spatial data sets falling under the Protected sites spatial data theme are therefore a common resource used in the context of a wide range of implementation, monitoring and assessment activities related to the objectives and measures of several legal acts.

Similarly, Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (the Floods Directive) applies to inland waters as well as all coastal waters across the whole territory of the EU with the aims to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. The directive required Member States to carry out a preliminary assessment by 2011 to identify the river basins and associated coastal areas with a potential significant risk of flooding. For such zones they then needed to draw up flood hazard and risk maps by 2013 and establish flood risk management plans focused on prevention, protection and preparedness by 2015. Significant flood risk areas are defined on the basis of flood risk factors that contribute to the occurrence of flood disasters — i.e. hazard and exposure. For determining the hazard factor (the severity of a flood event), one needs to dispose of spatial data covered by INSPIRE data themes such as hydrography, land cover, elevation, meteorological and geographical features, as well as soil and environmental monitoring facilities. For determining who and/or what are exposed to the risk of inland flooding and to assess their vulnerability, spatial data sets covered by INSPIRE data themes such as Land use, Population distribution- demography, Protected sites, Production and industrial facilities, Utility and governmental services, Transport networks, and even Buildings and Addresses are needed. For flood protection, damage assessment and designing preventive and preparedness measures one needs in addition spatial data covered by INSPIRE data themes such as Area management/restriction/ regulation zones and reporting units, Habitats and

⁽⁵⁴⁾ <http://ec.europa.eu/environment/newprg>.

⁽⁵⁵⁾ http://inspire.ec.europa.eu/reports/position_papers/inspire_etc_pp_v2_3_en.pdf.

biotopes, Administrative units, Addresses and Orthoimagery. Flood management and decision support systems, including early-warning systems, play a fundamental role at all stages of a flood risk management cycle, from prevention and protection to preparedness, response and reconstruction. The information they are meant to deliver is used by many levels of government and plays a crucial role for alerting the public and engaging it in the broader dialogue of flood prevention such as land-use planning. At least 20 of the 34 INSPIRE data themes are relevant for this policy instrument. The coordinated collection and management of all relevant data sets requires therefore the involvement of many different public bodies that all hold pieces of the spatial data puzzle and an in-depth dialogue with those requiring the information.

The identification of 'which spatial data' are necessary for 'which measure' in an environmental act is a crucial step in linking INSPIRE to environmental policies.

5.3 Implementation progress in Member States with respect to environmental policies and INSPIRE

This section provides an overview of the approaches, experiences and progresses made by the Member States in setting up or aligning their SDIs to support the environmental *acquis*.

As documented in the Member States' reports of 2013, Member States have been setting up INSPIRE-related websites and geoportals and/or improving existing national, regional and/or thematic geoportals that serve as front-ends for data access often combined with information services tailored to needs of the many local to international policy information demands. In a number of cases, often in the context of European projects, Member States and/or their regions engaged in cross-border collaboration activities provide a 'common data and information space' for various INSPIRE spatial data themes.

In addition, there are a number of 'best practices' on INSPIRE implementation for environmental policies

discoverable on the Internet and through the annual monitoring and reporting sheets. For example, the UK's Local Flood Risk Management Strategy Areas ⁽⁵⁶⁾ portal recently started providing INSPIRE view and download services.

Natural and man-made disasters often have serious social, economic and environmental impacts. Not sharing spatial data is clearly not an option when facing such events. In this context, the EU-funded (GEO-GEOSS) EUGENE ⁽⁵⁷⁾ project, establishing a European 'geo-network', recommends: 'All service providers involved in the disaster management on European, national and regional level should follow the INSPIRE Directive without exceptions. Furthermore, the INSPIRE definitions and rules should become an essential contribution to the global spatial data infrastructure to ensure harmonised, comparable and usable products for users outside Europe and the global user communities'.

Another example regards the UK Land Registry providing a service to determine if a property is at risk of flooding ⁽⁵⁸⁾ through submitting a so-called Land Registry — INSPIRE ID enquiry and an e-commerce service in line with INSPIRE Art. 14.

Several of these services are reported in the yearly monitoring and reporting sheets of the Member States, and are in some cases also accessible through the INSPIRE geo-portal. For example, for Directive 2002/49/EC of the European Parliament and of the Council relating to the assessment and management of environmental noise, (the Noise Directive) noise protection areas in the Netherlands can be accessed through INSPIRE-compliant web feature services (Milieubeschermingsgebieden voor stilte (WFS voor Inspire)) ⁽⁵⁹⁾. These services allow these 'maps' to be integrated directly online for other applications, such as EIAs of infrastructure projects or permit procedures.

The recently operational geoportal of the Flemish region in Belgium ⁽⁶⁰⁾, for example, supports through such access the operational activities of many organisations in charge of implementing measures related to, for example, water management and inspections on compliance with

⁽⁵⁶⁾ <http://data.gov.uk/dataset/local-flood-risk-management-strategy-areas>.

⁽⁵⁷⁾ <http://www.eugene-fp7.eu>.

⁽⁵⁸⁾ http://eservices.landregistry.gov.uk/www/wps/portal!/ut/p/b1/04_Sj9CPykssy0xPLMnMz0vMAfGjzOKNjSxMDA1NjDwsjM3MDTxN3dyNDUNMjQ1MjPWDU_P0C7IdFQG9k5Tz.

⁽⁵⁹⁾ <https://data.overheid.nl/data/dataset/milieubeschermingsgebieden-voor-stilte-wfs-voor-inspire>.

⁽⁶⁰⁾ <http://www.geopunt.be>.

Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (the Nitrates Directive).

The Irish geoportal ⁽⁶¹⁾ is another example of a recently operational portal, presented as a shared government resource providing access to a network of spatial data from a wide variety of Irish public bodies and organisations for download and viewing. It has been created as part of the Irish Spatial Data Infrastructure project and is designed to facilitate the online sharing of spatial data according to the requirements of the Irish eGovernment Strategy and the INSPIRE Directive.

There is evidence that many Member States are now advancing at an accelerated speed in implementing INSPIRE as part of their related eGovernment activities. Of particular interest in the support of the 'governance' dimension of environmental policies is the growth of local (city-level) regional and thematic geoportals. For example, Scotland's Environment Web (SEWeb) ⁽⁶²⁾ brings environmental information together in one place for the first time. It provides access to data and information in a digital format, bringing together information on Scotland's environment so that it is easily available and in a useable form. It moves away from static reports to a website with access to the most up-to-date environmental information. Co-funded by the EU LIFE+ financial instrument, the SEWeb also includes the delivery mechanisms to meet a range of European and international obligations. It implements INSPIRE and the SEIS principles of maintaining data as close to source as possible, ensuring that up-to-date information is available from a single source to meet reporting requirements such as those for the Water Information System for Europe (WISE).

Another example of an advanced INSPIRE implementation is the Environmental Information Network for Andalusia portal (REDIAM) ⁽⁶³⁾. It integrates all environmental information in Andalusia generated by different centres that produce environmental information in the Autonomous Community of Andalusia and serves, that is, as a Regional Focal Point for reporting to the

EEA through the Eionet. Also, portals are emerging where information requirements of different policies are integrated. For example, the UK Natural England portal ⁽⁶⁴⁾ has joined spatial data on the environment with the EU Common Agricultural Policy (CAP)-related environmental stewardship funding scheme.

Thematic geoportals such as the German Marine Data Infrastructure (MDI-DE) ⁽⁶⁵⁾ are a best practice illustration of how an INSPIRE-based approach allows concrete collaboration of different data holders across borders. The distributed service-oriented architecture and implementation of INSPIRE services and data models allows serving information on several environmental policies (such as Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy — hereafter referred to as the Marine Strategy Framework Directive, or MSFD; the Water Framework Directive; and the Birds and Habitats Directives — collectively referred to as the Nature Directives) while supporting in addition national and regional use for intervention regulations and regional planning. Another example of a thematic portal is the EU co-funded GS-SOIL ⁽⁶⁶⁾ portal. It allows discovering INSPIRE-compliant harmonised soil data and services. The portal is the access point to a distributed service-oriented architecture covering 18 countries and 22 soil data providers on which the partners established and operated a network of services for spatial data sets and metadata. This network includes distributed services for data transformation, discovery, view and best practice for download. Also directly linked to INSPIRE is the edge-matching of common soil units at the borders and the comparison of soil map geometry complexities in comparable landform regions. European soil data comes from heterogeneous sources and are bundled through the portal in which issues such as multilingualism and data interpretation were considered thoroughly. The catalogue covers 335 soil information data sets such as general soil maps, sets of point data on basic soil parameters and soil thematic maps, as well as information on soil status dynamics (soil monitoring data sets). Despite the fact that there is currently no EU legislation directly related to soils (6th EAP Soil

⁽⁶¹⁾ <https://www.geoportal.ie/geoportal/catalog/main/home.page>.

⁽⁶²⁾ <http://www.environment.scotland.gov.uk>.

⁽⁶³⁾ <http://www.juntadeandalucia.es/medioambiente/site/rediam>.

⁽⁶⁴⁾ <http://www.naturalengland.org.uk/ourwork/farming/funding/es/hls/targeting/approach.aspx>.

⁽⁶⁵⁾ <https://www.mdi-de.org/mdi-portal/ui>.

⁽⁶⁶⁾ http://www.gssoil-portal.eu/Best_Practice/GSSoilBrochure_final_small.pdf and <http://www.gssoil-portal.eu/ingrid-portal>.

Thematic Strategy), soil information is provided through the portal to a wide range of users such as farmers, foresters and governmental authorities responsible for the management of agriculture and other land-exploiting sectors.

Another area where progress is tangible is in the field of statistics. Statistical offices at regional, Member State and EU level (Eurostat) have a long-standing history is proving 'strategic' information for policies. Intrinsically, many statistics can be considered 'spatial data' as they relate to an area, for example population density at the level of an administrative unit, annual averages of fractions of waste processed at the level of a country or region, and so on. Much of the information they produce is based on surveys (at a given location) and relates to the environment. For example, the UK Office for National Statistics⁽⁶⁷⁾ has recently opened up geographic data behind UK statistics through a new online Open Geography portal which allows the use of statistical data to produce and present statistics that are geographically accurate, consistent and comparable. Similar activities are reported by, among others, the European Commission's Eurostat⁽⁶⁸⁾ (GEOStat project⁽⁶⁹⁾), the German Federal Statistical Office⁽⁷⁰⁾ and Statistics Estonia⁽⁷¹⁾.

Existing portals, such as the German Portal-U and the Spanish IDEE provided substantial input to the development of the INSPIRE implementing rules and are gradually being re-engineered according to INSPIRE. Most Member States consider it premature, at this stage of the implementation of the INSPIRE Directive, to expect a more quantitative evaluation of the benefits that INSPIRE brings directly to policymaking in relation to policies and activities that may have a direct or indirect impact on the environment or to the implementation of the environmental *acquis*. The state of INSPIRE implementation with positive effects and certain obstacles is thoroughly described in Section 4.5.

Here, we can add additional examples of how the environmental information fulfilling the environmental *acquis* is available. For example, in Finland, the Finnish Meteorological Institute has decided to publish a major part of its meteorological

and oceanographic data sets as Open Data using open standard web service interfaces for geospatial data⁽⁷²⁾ in order to stimulate, inter alia, the development of applications. The data opening is part of the growing global trend of publishing environmental information as Open Data, and is part of the implementation of the Open Data policy of the Finnish Government and the EU INSPIRE Directive.

Additionally, INSPIRE is in line with the implementation of two other related 'horizontal' data and information EU policies: the 2003 Directive on Public Access to Environmental Information and the 2003 PSI Directive, which focuses on the economic aspects of reuse of information rather than on the access of citizens to information.

The implementation of INSPIRE is a long-time process sometimes intersected by communications of the European Commission on other initiatives meant to improve the availability of information for environmental governance. Examples of these are the 2008 Communication 'Towards a Shared Environmental Information System (SEIS)' (SEC(2008) 111, SEC(2008) 112), the 2012 Communication 'Improving the delivery of benefits from EU environment measures: building confidence through better knowledge and responsiveness' (COM (2012) 09 final), which introduced the concept of 'Structured Implementation Information Frameworks' (SIIF); and the 2013 Commission Staff Working Document 'EU Shared Environmental Information System-Implementation Outlook' (SWD (2012) 0398 final). Whereas these communications generally refer to INSPIRE as an underpinning enabling framework, it remains a challenge to inform the stakeholders in the Member States adequately on how these initiatives inter-relate and how they may affect the implementation of INSPIRE.

5.4 INSPIRE and reporting under the environmental *acquis*

This section elaborates on the relationship between INSPIRE and reporting under the environmental

⁽⁶⁷⁾ <http://www.ons.gov.uk/ons/rel/mro/news-release/ons-opens-up-geographic-data-behind-uk-statistics/news-release--ons-opens-up-geographic-data-behind-uk-statistics.html>: The portal allows ONS to comply with the EU's INSPIRE Directive that harmonises how geographic datasets are supplied across Europe.

⁽⁶⁸⁾ <http://www.efgs.info>.

⁽⁶⁹⁾ http://epp.eurostat.ec.europa.eu/portal/page/portal/gisco_Geographical_information_maps/geostat_project.

⁽⁷⁰⁾ http://inspire.ec.europa.eu/events/conferences/inspire_2013/schedule/submissions/31.pdf.

⁽⁷¹⁾ <http://www.efgs.info/news/estonia-census-mapping-application-released>.

⁽⁷²⁾ <http://en.ilmatietaenlaitos.fi/open-data-manual>.

acquis. It assesses the key issues and the progress made in using INSPIRE to improve the efficiency of reporting.

5.4.1 How INSPIRE relates to reporting

Reporting refers to the provision of information, in terms of content, quality, availability and frequency, by the Member States to the EU levels (Commission, agencies) as required by legislation. This could be distinguished from monitoring requirements, which refer to the requirement to collect data for certain purposes, irrespective of whether or not this information needs to be provided to the EU levels.

INSPIRE does not set requirements for the collection of new data, or for reporting such information to the Commission, since those matters are regulated by other legislation related to the environment ⁽⁷³⁾.

INSPIRE may, however, contribute to improving the effectiveness of the reporting processes and systems. As such, INSPIRE was designed to support the 2002–2012 6th EAP ⁽⁷⁴⁾ and, with regard to reporting, to support the implementation of Art. 10(f). The latter set goals for 'Reviewing and regularly monitoring information and reporting systems with a view to a more coherent and effective system to ensure streamlined reporting of high quality, comparable and relevant environmental data and information.'

Reporting requirements cover several important aspects: data on processes, procedures or organisations such as information on the transposition of legislation, and on the establishment of procedures or designation of bodies and data related to the state of the environment and its trends. Data reported on, for example, the state of the environment, trends and impacts (i.e. risk maps) have in many cases a spatial dimension (for example, a measurement or a statistical value of an environmental parameter at a certain location, over a given distance or for a given surface or area, the quality of bathing water at a beach, etc.). Hence, reported spatial data often have both a location and a content or attribute dimension. In particular, when these data relate to the areas different from the Member State as a whole (i.e. river basin areas, Natura 2000 sites, sea

regions, etc.), processing and analysing the data involves specific challenges for the Member States, because the underlying data needed to satisfy the EU reporting (and other) requirements may be scattered across many administrations and regional boundaries under responsibilities of several public authorities and subject to highly variable access and use conditions.

INSPIRE Directive Art. 17 stipulates the sharing arrangements between public authorities (state of implementation is described in Chapter 4). In particular, Art. 17(3) also stipulates that data sets and services provided by Member States to EU institutions and bodies in order to fulfil their reporting obligations under EU legislation relating to the environment shall not be subject to any charging. Reporting to the EU levels is in many Member States the role of one or several competent authorities, depending on the scope of the legislation. Those authorities have to rely on the input from a range and a network of thematic and regional data holders. Spatial data obtained from this network of providers needs processing to turn the data in to the format and content agreed with the EU levels. There is consequently a substantial scope to optimise such data transfers and processing by harmonising the data structures in terms of content, documentation at the source and making them available to the competent reporting authorities. In addition, spatial data held by a public authority (for example, on a protected site, a water body, or an industrial or governmental service utility) are often needed for more than one reporting activity as the geographical scope of many legal acts overlap (for example, the Water Framework Directive; Council Directive 76/160/EEC of 8 December 1975 concerning the quality of bathing water as amended by Council Directive 91/692/EEC (further amended by Council Regulation 1882/2003/EC), and Council Regulation 807/2003/EC — known as the Bathing Water Directive; the MSFD; and the Nature Directives). Making these data available through INSPIRE services on a permanent basis would allow responsible competent reporting authorities to harvest them online whenever a new report is due.

The MDI-DE is one example of an INSPIRE-based infrastructure meant to optimise the flow of data and information from different organisations for EU-level reporting purposes under various EU obligations.

⁽⁷³⁾ INSPIRE Preamble (13).

⁽⁷⁴⁾ <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52001DC0031>.

5.4.2 Issues and progress on INSPIRE and reporting

Reporting to the EU levels has a long-standing history. As the environmental *acquis* evolves over time, so does the reporting content. Systems for reporting have been evolving from paper-based reporting to more or less automated procedures established and agreed between the Member States and the EU levels. In many cases, 'legacy' reporting systems are in place and adjusted whenever new requirements emerge. For example, the EEA and Eionet developed a platform, Reportnet⁽⁷⁵⁾, which is in operational use since 2002, for accepting reported data. From the perspective of EU levels it was considered important to not disrupt or delay reporting while INSPIRE is still under construction.

From a Member States' point of view, it was important to ensure that the implementation of INSPIRE is well coordinated and in line or supporting the reporting flows and procedures that usually have their own time schedule not corresponding with the roadmap of INSPIRE implementation. Environmental reporting obligations address INSPIRE or make references to INSPIRE in several ways. Direct references to the INSPIRE Directive have been already explicitly provided in the environmental legislation, such as:

- Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)
- 2011/850/EU: Commission Implementing Decision of 12 December 2011 laying down rules for Directives 2004/107/EC and 2008/50/EC of the European Parliament and of the Council as regards the reciprocal exchange of information and reporting on ambient air quality (hereafter referred to as Decision 2011/850/EU under the Air Quality Directive). This Implementing Decision refers to INSPIRE and the role of the Commission as described in Preamble (7): 'To streamline the amount of information made available by Member States, to maximise the usefulness of such information and to reduce the administrative burden, Member States should be required to make the information available in a standardised, machine-readable form. The Commission, assisted by the European Environment Agency, should

develop such a standardised machine-readable form in line with INSPIRE.'

- Directive 2010/75/EC of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

While many reporting requirements have been used in the INSPIRE data specifications development (provided as use cases or reference material, for example the specifications agreed between the Member States and the EU levels in developing the WISE), specific pilot projects have also been set up with the cooperation of EU levels and Member States to evaluate and streamline the reporting requirements and INSPIRE provisions. Nevertheless, coordination between expert communities on environmental reporting and those involved in developing INSPIRE has proven to be a big challenge, both within the EU-level organisations and within the Member States. Within Member States these issues seem more pronounced in those Member States where the responsibility for INSPIRE is mainly attributed to ministries or organisations that are not directly involved in the reporting processes under the environmental *acquis*. Within the EU levels, it largely depends on a combination of sustained top-down direction and the buy-in of individual services whose main concern remains the timely delivery of reports under their responsibility. In addition, certain methodological and information and communication technology (ICT) aspects of INSPIRE appear highly technical for the thematic experts involved in the reporting expert groups. In other cases, experts knowledgeable about these issues would argue that INSPIRE does not go far enough: its data models are not sufficiently rich in content to cater for their reporting requirements, or the INSPIRE services are not sufficiently tailored to also take into account their non-spatial data reporting requirements.

However, while the basic INSPIRE data specifications, laid down in the INSPIRE Regulation, consciously do not take reporting requirements into account, they are built in such a manner as to allow for extension for reporting purposes, and more extensive examples were provided in the Guidelines accompanying the INSPIRE Regulation. In view of this complexity, it was decided to prioritise efforts on INSPIRE and reporting to these legal acts where reporting as part of a more substantial policy review

⁽⁷⁵⁾ <http://www.eionet.europa.eu/reportnet>.

needed to be overhauled. As a second priority, it was decided to leverage the integration of INSPIRE by putting forward explicit references in new legal acts when relevant, such as the MSFD.

Other existing reporting flows would not be directly affected, although their requirements would continue to be taken into account for further harmonisation with the INSPIRE data specifications and for testing in projects funded through EU- or national-level financial instruments. Reporting flows governed through statistical regulations (such as those related to waste legislation) would remain temporarily outside of the scope of this exercise.

As first pilot candidate, the Commission in collaboration with the EEA, launched a project in 2009 to develop INSPIRE metadata and data specifications aligned with the draft reporting content related to the reviewed Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (known as the Ambient Air Quality Directive). The pilot project ran in four different areas in the EU in border-crossing scenarios. It involved the national organisations with the legal mandate for reporting on air quality, as well as INSPIRE expertise from the public and private sectors.

Following on from this project, and on the basis of the experience gained, the Commission adopted in 2011 Decision 2011/850/EU under the Air Quality Directive. This Decision refers to INSPIRE and the role of the Commission as described in Preamble (7): 'To streamline the amount of information made available by Member States, to maximise the usefulness of such information and to reduce the administrative burden, Member States should be required to make the information available in a standardised, machine-readable form. The Commission, assisted by the European Environment Agency, should develop such a standardised machine-readable form in line INSPIRE.'

To move from the pilot phase to an operational system, the Commission and the EEA involved INSPIRE experts to establish a fully Air Quality (AQ) e-Reporting/INSPIRE-compliant reporting schema.

Thirteen pilot countries (by means of their information technology (IT) specialists) have then been actively engaged in the further development of the AQ e-Reporting process as both the EEA and the countries (Member States and EEA member countries) need to adapt their reporting systems. The resulting reporting system is being tested

throughout 2014 and should be fully operational to meet the 2015 reporting obligations.

At this stage of implementation, it is clear that the complex AQ e-Reporting requirements combined with those required for INSPIRE call for heavy involvement of IT expertise in adapting the systems to e-Reporting and successfully generating the data sets prescribed by Decision 2011/850/EU under the Air Quality Directive. This is a resource-intensive task for both the countries and the EEA in the first two years (2014 and 2015), after which the mechanism is expected to operate more smoothly. Benefits of automation in data gathering, delivery and processing, and minimised or eliminated manual intervention can only be harvested in subsequent years, 2016 onwards.

On the basis of the experiences gained in both governance and the technical implementation of the AQ e-Reporting pilot, more pilots are envisaged for other reporting streams. In 2014, the Commission and the EEA will examine further the feasibility for running a pilot development of INSPIRE-based e-Reporting for the forthcoming reporting under the MSFD (2008/56/EC).

A similar activity is considered for reporting under Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (also known as the Industrial Emissions Directive or IED), which replaced the Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control (also known as the Integrated Pollution Prevention and Control Directive) and five other sectoral directives (e.g. Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste — the Waste Incineration Directive; and Directive 2004/42/CE of the European Parliament and of the Council of 21 April 2004 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC — the VOC Directive) from January 2014.

Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants (the Large Combustion Plants Directive, or LCP Directive) will be replaced from the beginning of 2016. The first reporting including geo-referenced data on about 50 000 industrial installations will take place

in 2017. The INSPIRE component will be looked at during the establishment of the data reporting framework.

Also, Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC (also known as the SEVESO III Directive) has to be transposed and implemented by Member States by 1 June 2015. Reporting of geo-referenced data will include information on establishments covered by the directive and on major accidents.

With regard to the Water Framework Directive and other water-related directives, a study is under way to examine how the various directives are linked to INSPIRE provisions and in particular to the data specifications. In addition, INSPIRE-conformant e-Reporting in the context of the 2016 river basin management is being investigated. The reporting guidance for the 2016 WFD reporting is prepared to ensure INSPIRE requirements are properly included, described and implemented. The latter work starts in 2014 and will last until the beginning of the data reporting under the WFD at end-2015 up to March 2016.

Already in 2013, EEA started an INSPIRE-CDDA (nationally designated areas) harmonisation project with several countries from Eionet. While this is a voluntary reporting next to the environmental *acquis*, it serves as a learning exercise for other e-Reporting cases.

The above INSPIRE-related e-Reporting activities on air, emissions and water already cover an important part of the environmental reporting. Further cooperation at several levels, combining the policy thematic and ICT expertise is indeed needed to cover other policy areas related to environment. For example, further environmental legislation in areas like chemicals, climate change adaptation and mitigation, forestry, health, land, noise and soil either do not contain references to INSPIRE or they are only very generic. There is awareness about INSPIRE though and selected data are already being made INSPIRE-compliant (e.g. in the area of the Climate-ADAPT work under the climate change agenda) but largely practical steps to implement INSPIRE still need to be taken.

There are comments from Member States, the United Kingdom for example, that although building blocks are in place there are still significant unnecessary burdens on Member States related to the timelines

and existing technical requirements of reporting for environmental directives. The EU governance is increasingly addressing these concerns.

In cases where legislation is not (fully) developed, the existence of relevant spatial data themes and their approved data specifications provide a clear basis for such linking. It is expected that these binding reporting obligations will further accelerate the implementation of INSPIRE in Member States and EEA member countries.

5.5 Summary of links to other environmental legislation and to environmental policies

Implementation experiences in Member States vary largely. There are many successful initiatives already but there is no clear pattern due to the early stage of implementation. The growth in the establishment of SDIs not necessarily related to the environmental domain is measurable. It provides the basis for environment-related implementation activities. There is a set of European-funded projects that act as a catalyst for implementations.

Summarising the implementation experiences related to the relevant environmental legislations (largely Annexes II and III) in the middle of 2014 leads to only few tangible results. While this can be attributed to the relatively long legal timeframe for this implementation (depending on whether newly collected, restructured or 'as is'), which sets a first milestone in autumn 2015 and a final deadline in autumn 2020, it is of concern when we compare this with the Annex I implementation. Here, we do not see much INSPIRE-conformant data sets available. The deadline for 'newly collected and heavily restructured spatial data sets' was November 2012 but Member States seem to avoid classifying data sets into this category and rather refer to the November 2017 deadline.

It is understood that as part of the process of establishing INSPIRE data specifications, thematic legislation has been analysed in order to identify key data and their cross-domain relationships. These characteristics are provided in the form of data models included in the implementing rules on interoperability of spatial data sets and services and in the technical guidelines in a way that allows further extended data modelling and referencing of the thematic data to the spatial objects described in INSPIRE. In practice, this has been partially successful. Positive results were achieved where the TWGs were equipped with a balanced set of

experts with good domain knowledge and where either the complexity of the topic was feasible to address or where the data work had a long tradition. Neutral or negative results can be seen in topics that were very broad or sectorial-oriented, where few experts could be involved, and where the experiences of data modelling within the topic area were limited. In several cases, 'extended application schemas' were developed and reside largely in the INSPIRE guidance material. Since the provisions as set in the implementing rules are already quite demanding, it can be expected that such guiding material will overall be of limited relevance.

There have been 'early adopters' though, first and foremost in the field of AQ e-Reporting. While implementation is still ongoing, it has been perceived as a significant effort, partly based on

the general thematic overhaul of the reporting and partly on the additional INSPIRE requirements. Most European policy frameworks do not mention INSPIRE while they may speak about the need to have a structured and standardised approach on data that INSPIRE aims at. They are getting increasingly cross-thematic however, a development that INSPIRE is designed to support.

Direct reference to INSPIRE is included in few, newer legal acts, bringing about additional efforts to explain actions needed and the benefits they will bring. There seems to be a general impression that this is additional work that pays off only over time and mainly for cross-thematic use cases rather than in the individual thematic area. Since this evaluation is in its early stages, benefits will only arrive after a critical amount of thematic data become INSPIRE-conformant.

6 Links to other policies and activities

The INSPIRE Directive establishes an infrastructure for spatial information in Europe for the purposes of EU environmental policies and policies or activities that may have an impact on the environment. The infrastructure is a multi-purpose one for the exchange and sharing of spatial data, meaning that it can be used for other thematic sectors as well.

There are in fact many EU and national policies, strategies and guideline documents that — although not part of the environmental *acquis* — have introduced a dependency with INSPIRE. The degree of dependency varies: EU legal acts typically limit themselves to referring to INSPIRE as the relevant framework in the recitals, whereas guidelines to these policies as well as national location strategies are often inspired by and deeply anchored onto INSPIRE.

Based largely on results of the Interoperability Solutions for European Public Administration (ISA) Action 2.13 Towards a European Union Location Framework (EULF) ⁽⁷⁶⁾, this chapter reviews these activities by making a distinction between three categories: 1) EU policies that the directive mentions in the recitals, notably the PSI Directive, Galileo and Copernicus; 2) EU policies that are not mentioned in the directive but that have introduced a link or dependency with INSPIRE; and 3) relevant policies and strategies at national level that are not related to the environment.

6.1 Reuse of public sector information

The INSPIRE Directive in Recital 8 places particular emphasis on the PSI Directive ⁽⁷⁷⁾. The reference to the PSI Directive was introduced as INSPIRE targets the sharing of public sector geographical and environmental information, thus complementing the PSI Directive with additional measures.

The geographic and environmental information of INSPIRE represents a significant portion of the total economic value of PSI, and the data themes of INSPIRE are primarily related to issues in the public sector, which creates important synergies. There are also various differences between the two. For example, the PSI Directive defines the rules for exploiting public sector information once it has been made available, but it allows the EU Member States the freedom to define what information they make available as well as when and how. By contrast, INSPIRE is more prescriptive as it defines what information must be made available when, in what format, and how it should be documented and made accessible. INSPIRE therefore addresses three of the main issues surrounding PSI: discovery, availability and use. From this perspective, the implementation of the INSPIRE Directive promised to improve significantly the availability of public sector information, which has indeed happened in a number of countries (e.g. Denmark, Germany, Spain).

It has been argued ⁽⁷⁸⁾ that there are some inconsistencies between the two frameworks, caused by a lack of a clear demarcation between the public task of government and its commercial activities. During the review and preparation of the amendment of the PSI Directive, staff from the Commission and Member States' experts have worked to ensure that the experience gained with the application of the PSI Directive and the data sharing obligations under the INSPIRE Directive was taken into account. The PSI Directive, the revision of which was published in the Official Journal as Directive 2013/37/EU ⁽⁷⁹⁾ and is to be transposed into national laws by July 2015, has seen a number of important changes:

- creation of a genuine right to reuse public information: all generally accessible information will become re-usable;

⁽⁷⁶⁾ http://ec.europa.eu/isa/actions/02-interoperability-architecture/2-13action_en.htm.

⁽⁷⁷⁾ Directive 2003/98/EC of the European Parliament and of the Council of 17 November 2003 on the re-use of public sector information.

⁽⁷⁸⁾ <http://www.ec-gis.org/Workshops/11ec-gis/papers/303janssen.pdf>.

⁽⁷⁹⁾ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:175:0001:0008:EN:PDF>.

- new default charging rule based on the marginal cost for reproduction, provision and dissemination of the information (in exceptional cases, full cost recovery will remain possible);
- cultural institutions brought within the scope of the directive;
- increased transparency requirements with regard to charges and conditions applied by public sector bodies;
- new rules on digitisation agreements, which protect the cultural sector and the interests of the general public.

The Commission will assist Member States in the transposition of the new rules throughout 2013 and 2014. In mid-2014 the Commission adopted a Communication regarding 'Guidelines on recommended standard licences, data sets and charging for the re-use of documents' (2014/C 240/01) ⁽⁸⁰⁾.

The PSI Directive has thus become an indispensable instrument for the EU's data economy. In fact, the European Commission has included it as part of a package of European policies on Open Data ⁽⁸¹⁾ that includes also the European Union Open Data Portal ⁽⁸²⁾, and the pan-European Open Data portal, further integrated by the EU's commitments in relation to the G8 Open Data Charter ⁽⁸³⁾. The European policies on Open Data have as main objectives: 1) to create a 'data value chain friendly' policy and legal environment; 2) to build a multilingual (Open) Data infrastructure; and 3) to support research and innovation. There is a strong link with INSPIRE. In various countries such as Germany and France, activities are under way to include INSPIRE data in national Open Data portals. Also, the EU's G8 commitments on Open Data consider geographic information and environmental information to be high-value data, both of which are central to INSPIRE as well. A document on the EU implementation of the G8 Open Data Charter was published in October 2013 ⁽⁸⁴⁾, including reference to INSPIRE.

There is an opportunity to strengthen the synergy between INSPIRE and Open Data initiatives to find practical solutions for better reuse of data and data sharing. Although there is no legal obligation to do so, some Member States have already integrated the two successfully. Others may decide to do so as well. Section 7.2.12 discusses the necessary actions further.

6.2 Galileo

In 2009, Member States conferred to the EU a stronger role in space matters. The Treaty of Lisbon introduced for the first time a specific space competence for the EU, enshrining space policy as an EU policy in its own right. Galileo ⁽⁸⁵⁾ and Copernicus are the EU's flagship space programmes, and together with INSPIRE they are considered to be important European building blocks for addressing some of the major priorities for the EU 2020 strategy. Galileo is referred to in the INSPIRE Directive (Recital 10) as the establishment of INSPIRE will represent significant added value for — and will also benefit from — Galileo. With Galileo becoming operational, in 2013 a European GNSS Agency (GSA) has been established in Prague. The Agency's objectives include the achievement of a fully operational Galileo system and to make it the world's leading satellite navigation system for civilian applications. In the Commission's Inter Service Consultation from the Directorate-General for Enterprise and Industry (DG ENTR) on the '2013 work programme of the European Satellite navigation programmes (EGNOS & Galileo)' in January 2013, the importance of temporal and geodetic compatibility with INSPIRE was flagged.

6.3 Copernicus

The Copernicus programme ⁽⁸⁶⁾, formerly known as Global Monitoring for Environment and Security (GMES), is the European programme on Earth Observation that boasts an important environmental dimension and a long-standing relation with INSPIRE. The notion of an ESDI was introduced at

⁽⁸⁰⁾ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:C:2014:240:TOC>.

⁽⁸¹⁾ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0882:FIN:EN:PDF>.

⁽⁸²⁾ <https://open-data.europa.eu/en/data>.

⁽⁸³⁾ <http://www.g8.utoronto.ca/summit/2013lougherne/index.html>.

⁽⁸⁴⁾ http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=3489.

⁽⁸⁵⁾ Council Regulation (EC) No 876/2002 setting up the Galileo Joint Undertaking; COM(2010) 308 'Action Plan on Global Navigation Satellite System (GNSS) Applications'.

⁽⁸⁶⁾ <http://www.copernicus.eu>.

an early stage as the necessary linkage between the *in situ* and space components of Copernicus. At the same time, it is anticipated that Copernicus data will become a key resource for the creation of new spatial information related to various INSPIRE data themes.

Much of the groundwork for both INSPIRE and Copernicus was done in cooperation and in parallel. The results of the GMES requirements analysis (Wyatt et al., 2003) were fed into the INSPIRE process at an early stage. Meetings of the INSPIRE Expert Group were supported by Copernicus, and a number of Copernicus research projects provided direct support to the development of INSPIRE in terms of reference material (e.g. RISE⁽⁸⁷⁾), experts that participated in drafting teams and thematic working groups (e.g. GIS4EU⁽⁸⁸⁾), and indirect support to the implementation of INSPIRE (e.g. Humboldt⁽⁸⁹⁾). Many other Copernicus projects contributed in different ways to the development of INSPIRE. For instance, experts from the Copernicus Marine Service (MYOCEAN⁽⁹⁰⁾) contributed to the relevant INSPIRE data specifications. The discussions with Atmospheric Service (MACC⁽⁹¹⁾) and the down-stream service PASODOBLE⁽⁹²⁾ were mainly related to metadata. The interaction with Land and Emergency Services and INSPIRE took place indirectly by the introduction and promotion of INSPIRE components within these services through the GIGAS⁽⁹³⁾ project.

The role of INSPIRE in Copernicus' *in situ* data component was addressed by the GMES In-Situ Coordination (GISC⁽⁹⁴⁾) project. Its aim was to act between data providers and to develop an initial framework for *in situ* data that also takes into account how demand will change over time. The outcome of the project is the preparatory work for setting up the Copernicus *in situ* component. The results of the preparatory work are: 1) a refocus of networks of actors; 2) clarified and prioritised data requirements; 3) a framework to deliver the data; and 4) EEA's and networks' focus on coordinating the *in situ* component.

The GISC project explored the possibility to use INSPIRE as the basis for the initial *in situ*

framework — i.e. for a sustainable provision of *in situ* data for Copernicus services. To do so, the project mapped the Copernicus *in situ* data requirements and found a strong link with the INSPIRE data specifications for all Copernicus services. Around 90 % of all requirements matched with INSPIRE data specifications. An exception was the Copernicus Marine Service where about 50 % of the required *in situ* data (e.g. profile measurements of temperature, salinity and biogeochemical parameters) were not covered by the Oceanographic geographical features data specification. As a result, the GISC project submitted a proposal to the INSPIRE consultation for Annexes II and III to include measurements of profiles in the Oceanographic geographical features data specification which was accepted.

As a result of all these interactions, there are mutual cross-references between INSPIRE and Copernicus in the INSPIRE Directive and in the Copernicus Regulation (377/2014)⁽⁹⁵⁾. Specifically, the latter requires that: *Copernicus data should be compliant with Member States' spatial reference data as well as with implementing rules and technical guidelines of the infrastructure for spatial information in the Union established by Directive 2007/2/EC of the European Parliament and of the Council (377/2014, Preamble 9).*

These are strong requirements highlighting the importance of INSPIRE, particularly for the *in situ* component of the Copernicus programme.

With respect to data policy, there are links with INSPIRE in Recitals 1 and 17, and Art. 2, and Art. 5 of the Commission Delegated Regulation (EU) No 1159/2013 of 12 July 2013 establishing registration and licensing conditions for GMES users and defining criteria for restricting access to GMES-dedicated data and GMES service information. Of more significance is the full, open and free-of-charge basis for access to dedicated mission data and Copernicus information (Art. 23 (2)), which will enable the provision of important information layers for INSPIRE as well as nudging the policies of the Member States further in the direction of Open Data.

⁽⁸⁷⁾ <http://www.eurogeographics.org/content/rise-0>.

⁽⁸⁸⁾ www.gis4eu.eu.

⁽⁸⁹⁾ <http://www.esdi-humboldt.eu/home.html>.

⁽⁹⁰⁾ www.myocean.eu.org.

⁽⁹¹⁾ <http://atmosphere.copernicus.eu>.

⁽⁹²⁾ <http://www.myair.eu>.

⁽⁹³⁾ <http://www.thegigasforum.eu/project/project.html>.

⁽⁹⁴⁾ <http://gisc.ew.eea.europa.eu>

⁽⁹⁵⁾ http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.122.01.0044.01.ENG.

6.4 Links to other, non-environmental EU policies and activities

There has been a growing awareness within Commission services that INSPIRE is relevant when a policy requires Member States to provide location-related information. The participatory approach to the development of INSPIRE and the subsequent inter-service consultation have contributed to this, and sometimes the Member States themselves have promoted INSPIRE in TWGs and committees.

This has led to references to, and use of, INSPIRE in a wide range of non-environmental activities such as transport (e.g. the Intelligent Transport Systems Directive; the activities around railML) and marine (Marine Knowledge 2020, Maritime Spatial Planning).

Thus far, the references to INSPIRE from within non-environmental legislation are prudent, probably because INSPIRE implementation is still ongoing. In addition, it is not yet clear to what extent INSPIRE will be addressing the specific thematic requirements of the other policies. The INSPIRE Directive is mentioned in the recitals, for instance by saying that coordination with INSPIRE should take place (the ITS Directive) or that INSPIRE should be considered as a potential framework (the draft Regulation on measures to reduce the cost of deploying high-speed electronic communications networks).

At the level of guidance documents, work programmes and tendering processes there are numerous examples of how INSPIRE ties in with the work of the Commission, thereby supporting the implementation of non-environmental policies. The Commission's lead services on INSPIRE (DG ENV, Eurostat, JRC), as well as the Directorate-General for Informatics (DG DIGIT) and the Secretary General are providing INSPIRE-related feedback in the context of inter-service work groups, inter-service consultation and domain-specific expert groups with the Member States, and through COGI. The following paragraphs illustrate for key policies their relation with INSPIRE.

The Digital Agenda for Europe (DAE) aims to reboot Europe's economy and help Europe's citizens and businesses to get the most out of digital technologies. It is one of the flagship initiatives under EU 2020, the EU's strategy to deliver smart

sustainable and inclusive growth. INSPIRE is related to various actions of the DAE. With continuous advances in ICT making solutions more cost efficient, the opportunities to use them in support of achieving EU environmental policy objectives become increasingly evident. DAE Action 86 addresses this by promoting the eGovernment's 'e-Environment' services that will be available and interoperable across administrative and jurisdictional boundaries, and by 2020 the quality and availability of data will be sufficient to support EU policy objectives related to the environment achieved at pan-European level. The Interoperability Solutions for European Public Administrations programme (also known as the ISA Programme), led by DG DIGIT, is progressing actions on ICT interoperability (DAE Action 21). Two ISA actions (EULF and ARE3NA) are dealing with location aspects thereby promoting INSPIRE. EULF is defining a policy framework and ARE3NA the tools for implementing INSPIRE across all sectors and to support cross-border applications. A formal Working Group on Spatial Information and Services has been established under the ISA Committee that bridges the eGovernment and INSPIRE communities, and advises ISA on matters related to spatial information and services.

Related to DAE pillar IV (fast and ultra-fast Internet access), a proposal has been put forward for a Regulation of the European Parliament and of the Council on measures to reduce the cost of deploying high-speed electronic communications networks⁽⁹⁶⁾. Recital 18 identifies INSPIRE as the framework to be used for the exchange of the spatial information that Member States will make available in this context.

Energy — Under timetable established by Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (hereafter referred to as the Energy Performance of Buildings Directive, or EPBD), new standards for certification and inspection have to be in place by 2015. By 2018, new buildings have to be (nearly) zero energy. As per the mandate 2010 M/ 480 to CEN, CENELEC and European Telecommunications Standards Institute for the elaboration and adoption of standards for a methodology calculating the integrated energy performance of buildings and promoting the energy efficiency of buildings, in accordance with the terms set in the recast of the EPBD⁽⁹⁷⁾, the new standards have to take account of INSPIRE. European

⁽⁹⁶⁾ http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=1879.

⁽⁹⁷⁾ http://ec.europa.eu/energy/efficiency/buildings/doc/2010_mandate_480_en.pdf.

guidelines are being worked on and the relationship with INSPIRE should be assessed in this process.

Raw materials — The report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the implementation of the Raw Materials Initiative (COM(2013) 442 final) states that 'synergies should contribute to an improved European raw materials knowledge base in a co-ordinated way, in particular taking into account the official road map and progress in implementing the ESDI (as defined by the INSPIRE Directive) by all EU Member States as well as future opportunities within the Copernicus programme'. There has to be continuous dialogue between the Commission services (DG ENTR, Directorate-General for Research and Innovation (DG RTD), EC/EEA INSPIRE Team) and the relevant organisations within the Member States. This activity is supported with EU co-funded projects such as Minerals4EU ⁽⁹⁸⁾.

Maritime policies — Regulation (EU) No 1255/2011 of the European Parliament and of the Council of 30 November 2011 establishing a Programme to support the further development of an Integrated Maritime Policy, Art. 3, 2(c), states that: '(the programme shall develop) a comprehensive and publicly accessible high quality marine data and knowledge base which facilitates sharing, reuse and dissemination of these data and knowledge among various user groups using existing data, thus avoiding duplication of the databases; for this purpose, the best use shall be made of existing Union and Member State programmes, including INSPIRE and GMES'.

INSPIRE is also referred to in the Commission Communication 'Marine Knowledge 2020 marine data and observation for smart and sustainable growth'(COM(2010) 0461 final), and in proposed regulations related to the Common Fisheries Policy as necessary to provide the basic framework for sharing of data sets and services. Finally, there is the White Paper on Integrating Maritime Surveillance: 'The Implementation of the Common Information Sharing Environment (CISE)' ⁽⁹⁹⁾. CISE uses INSPIRE in three ways: 1) reusing methodologies and best practices; 2) reusing and/or extending data models; and 3) standardisation ⁽¹⁰⁰⁾.

Statistics — The proposal for amending the Regulation on the European statistical programme 2013–2017 calls for ensuring that geo requirements align with INSPIRE.

Transport — The ITS Directive is the first non-environmental EU legal act that refers to INSPIRE. In particular, Recital 22 states that 'In order to guarantee a coordinated approach, the Commission should ensure coherence between the activities of the Committee established by this Directive and [...] the Committee established by Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)'.

A formal coordinated approach by way of the Committees as requested by the ITS Directive has not taken place as of yet. As part of the ITS Action Plan, a report on 'The Availability of Public Data for Digital Maps' (December 2011) recommends adopting the INSPIRE organisational approach and using the ROSATTE specifications for road networks as an extension to the INSPIRE specifications. Important progress has been made both at the level of the Member States — and in particular in the Nordic countries — and through discussions between staff of Commission services (Directorate-General for Mobility and Transport, Directorate-General for Communications Networks, Content and Technology, DG DIGIT and JRC). The ISA EULF Action 2.13 will undertake a pilot to assist the further development of the Transport Network ITS Spatial Data Deployment Platform (TN-ITS) specifications for road data, taking account of the INSPIRE road network specifications.

With regard to air traffic information, the Single European Sky (SES) legislative framework, supplemented by the Single European Sky ATM Research (SESAR) programme, aims to increase the overall performance of the Air Traffic Management (ATM) system in Europe. The SESAR programme has been leveraging INSPIRE. SESAR contributed to drafting of the (Air) Transport Network theme and also used the output of INSPIRE to develop its own work: not only the technical aspects but also the legal aspects of INSPIRE were taken into account. A study on the legal aspects of ATM

⁽⁹⁸⁾ <http://www.minerals4eu.eu>.

⁽⁹⁹⁾ http://ec.europa.eu/governance/impact/planned_ia/docs/2012_mare_002_cise_en.pdf.

⁽¹⁰⁰⁾ http://inspire.ec.europa.eu/events/conferences/inspire_2013/pdfs/25-06-2013_AUDITORIUM_11.00%20-%2012.00_11-Franco%20Oliveri_Franco-Oliveri.pdf.

services⁽¹⁰¹⁾ considered INSPIRE as an example of what actions can be taken in terms of public-private partnership, PSI, intellectual property rights (IPRs), licensing, funding and pricing policy. Currently, the ATM and INSPIRE communities still work in parallel, although further alignment and coordination between both communities would provide additional benefits.

EU Rail Interoperability legislation — Register of Infrastructures (RINF)⁽¹⁰²⁾ — The International Union of Railways (UIC) has to comply with different directives involving data collection and management, such as the RINF required by the EU Interoperability legislation where compliance is required by 2015. The UIC is carrying out a feasibility study to create a shared format for data exchange based on INSPIRE. A topological data model and appropriate identifiers need to be agreed. The approach could then be applied to other information requirements. It is anticipated that the resulting data model can serve the need for several EU directives and activities: INSPIRE, RINF, Network Statement, the European Rail Freight Corridor Organisations, the European Train Control System. Once in place, huge savings in data management could be achieved with a common data model and corresponding exchange format⁽¹⁰³⁾.

European Neighbourhood Policy (ENP) — The coordination with the Directorate-General for EuropeAid Development & Cooperation (DG DEVCO) has been very important for capacity building in the ENP countries. An excellent recent example is the INSPIRATION project, which is a multi-country project aiming at promoting SDI and coordinating its further development in the Western Balkan Countries⁽¹⁰⁴⁾. Coordinating the activities also with the World Bank, the EC/EEA INSPIRE Team has been involved in the tender specifications and the evaluation of the tender, and was connected to the project as a member of the Steering Committee.

6.5 Alignment of national policies and strategies with INSPIRE

A survey of the use of location information in eGovernment carried out by the EULF project

identified a large number of different public services using location information, many of which have the potential for integration in cross-border services.

The services are a mixture of environmental and non-environmental services. Location information needs to be in place to underpin all types of services. The strategies adopted by Member States are reviewed in the 'Assessment of Conditions for the European Union Location Framework' (Vandenbroucke et al., 2014). For example, the NSDI Strategy of Croatia includes an analysis of all national and European policies dealing with the production, use and exchange of location information. The Dutch GIDEON strategy (2008–2011) links (potential) use of location information to the coalition agreement of the national government. It is argued that location information plays a major role in the realisation of the different pillars in this agreement, such as a sustainable living environment, an innovative, competitive and enterprising economy, and a service-minded public sector, and in the promotion of social cohesion.

An important approach for improving alignment between policies at the Member State level is the establishment of base registers or authentic registers. Many Member States consider the establishment of a common set of authentic data or reference data essential for realising the integration of location information in many domains. Reference data enable the integration of different types of information, including data from various sources and thematic areas. Several Member States have one or more spatial data registers as part of a broad set of authentic registers. The Dutch Government started in 2000 with the development of the concept of a system of key registers. The Netherlands now has four geo-registers in place: topographical data, cadastral data, address data and buildings data. Two other key geo-registers, the large-scale standard map of the Netherlands and the subsurface key register, are planned to be in place soon. These six geo-registers are part of a system of 13 key registers. In the Slovak Republic, the Spatial Information Register is one of the four basic registers. Denmark has an ambitious strategy to set up core registers, including location registers for geography, road and real estate, and properties, housing, buildings and addresses. The intentions of

⁽¹⁰¹⁾ http://www.eurocontrol.int/sites/default/files/content/documents/information-management/study_on_the_legal_aspects_of_atm_services_and_the_possibl.pdf.

⁽¹⁰²⁾ http://www.era.europa.eu/Document-Register/Documents/IU-Recommendation_on_specification_of_RINF-Final_Report.pdf.

⁽¹⁰³⁾ http://www.poweredbyinspire.eu/documents/Powered_by_Inspire-2.pdf.

⁽¹⁰⁴⁾ http://inspire.ec.europa.eu/documents/INSPIRE_/JRC86293_2013_Report_NSDI_Balkan.pdf.

the strategy are explained in the 'Good Basic Data for Everyone' document ⁽¹⁰⁵⁾. The Danish basic data programme is part of the eGovernment strategy. A common infrastructure has been established to ensure the stable and efficient distribution of data and all basic data have to conform to the same technical requirements in order to make it possible to link data. Significant cost savings are projected through the Danish basic data programme. Clearly, in its role to standardise core geographic reference data sets, INSPIRE has an important contribution to make in national base register programmes. INSPIRE should also be alert to the different national requirements in implementing these initiatives.

Some examples on cross-border services are emerging but there are many more opportunities for other services where INSPIRE can play a role. A particularly good example is the Czech Republic's IDOS ⁽¹⁰⁶⁾ multi-modal cross-border journey planner. IDOS integrates international, national, regional and urban public transport connections including bus, rail and air. Any person can access the service online to obtain information on a planned journey, including timetables, links to the reservation systems and information about connections (e.g. time, distance, transfer time). The service is location-enabled: the traveller can select origin and destination on a map and view the travel route. In developing IDOS, significant efforts were made to align the information gathering activities of different public transport operators. To regulate the data collection process and the roles of the different process owners, specific legislation was prepared. Also, cooperation, data interchange and service agreements were set up to align the activities of all parties involved.

The EULF ⁽¹⁰⁷⁾ Assessment made the following observations regarding the policies and legislation at EU and Member State levels dealing with location information:

1. Although some of the EU policy areas, such as the European Statistical Programme 2013–2017 and the actions under the Intelligent Transport Systems Directive, make reference to INSPIRE, this is not the case in many other policy areas. A much wider recognition of the benefits of a consistent and interoperable approach and the

potential to extend the INSPIRE approach to other sectors is still needed. In this context, a general reference to INSPIRE is not enough, legal and strategic initiatives should define in more detail how alignment can/should be achieved from the legal, organisational and technological perspective.

2. Also the way reference is made to INSPIRE and/or to location information in procurement is very variable. It is often very vague, without reference to the key documents and sometimes defining requirements that are even (partially) contradictory to INSPIRE requirements. In some cases reference is made to INSPIRE but in very general terms. In other cases, even no reference is made at all and requirements are formulated to define new data models or to collect existing data without making use of INSPIRE components.
3. A necessary step for policy and strategy alignment at Member State level is the identification of policies dealing with the production, use and exchange of location information. Agreement should be found on common procedures, definitions and standards between different policies and legislation.

The EULF Assessment found that good practices in the alignment of policies and legislation dealing with location information take into account the following three lessons:

1. Improved alignment should be realised in thematic policies that are relatively mature in their use of location information. These include policies related to Transport, Environment, Marine, Agriculture, Consumer Protection and Health, and Energy, as well as cross-cutting policies on eGovernment and Open Data. However, attention also needs to be given to policy areas where there is less maturity in the use of location information.
2. In line with existing guidelines for the procurement of standards-based ICT, similar guidelines on how to refer to INSPIRE, location information and location-based services and geospatial standards should be developed, and should be adopted by EU and Member State

⁽¹⁰⁵⁾ <http://uk.fm.dk/publications/2012/good-basic-data-for-everyone>.

⁽¹⁰⁶⁾ <http://jizdnirady.idnes.cz/vlakyaubusymhdvse/spojeni>.

⁽¹⁰⁷⁾ http://ec.europa.eu/isa/actions/02-interoperability-architecture/2-13action_en.htm.

institutions when conducting a procurement process.

3. At Member State level, a successful approach for improving alignment between policies is the establishment of base registers or key registers and the compulsory use of these registers by public authorities. The contribution of key geo-registers to the alignment of policies especially is high in case these geo-registries are part of a broader set of key registers in eGovernment.

6.6 Links to other activities

6.6.1 Standardisation

The INSPIRE implementing rules and the technical guidelines documents have dependencies with European and international standards (both formal standards-developing organisations (SDOs) such as ISO and CEN, as well as de-facto SDOs such as OGC). These dependencies were introduced with the intention that the implementation of INSPIRE would be facilitated because industry would support these standards. In fact, from the public consultation the mandatory link with standards is seen as important as it creates clarity.

However, from the public consultation the following key messages emerged related to standardisation:

- interoperability through the use of standards is not guaranteed as there are issues with the compatibility and interpretation of standards;
- better alignment of INSPIRE implementing rules and technical guidelines with widely implemented open standards — or potentially the other way around — is needed. This requires activities to amend geographic information standards to comply with INSPIRE, and promote the uptake of standards, including their use in public procurement;
- new requirements are emerging (e.g. Open Data) and need to be addressed.

The dependencies will be managed in the context of the INSPIRE MIF.

A coordinated approach among the EU members to SDOs concerning INSPIRE-related standardisation is needed. In particular with a view on the evolution of INSPIRE, this coordination should go beyond the organisations listed above, and include general IT standardisation (W3C, OASIS) as well as selected thematic SDOs.

This coordination should become part of the activities of the MIF.

6.6.2 International initiatives

The INSPIRE Coordination Team participates in relevant international activities to ensure that the European investment and experience in INSPIRE is built upon and recognised also at the international level. The most relevant are the UN-GGIM and GEOSS.

The UN-GGIM⁽¹⁰⁸⁾ aims at playing a leading role in setting the agenda for the development of global geospatial information and to promote its use to address key global challenges. It provides a forum to liaise and coordinate among Member States, and between Member States and international organisations. At its substantive session in July 2011, the Economic and Social Council considered the report of the Secretary General (E/2011/89) and adopted a resolution to create the United Nations Committee of Experts on Global Geospatial Information Management (2011/24). A number of European members of the UN-GGIM are proposing to establish a Regional Committee of UN-GGIM for Europe, which, once established in August 2014, aims at building on existing efforts to maximise the benefits and investments in INSPIRE, the European Statistical System (ESS) and related initiatives.

GEOSS is the Global Earth Observation System of Systems, developed by the Group for Earth Observation⁽¹⁰⁹⁾, which comprises 90 countries and over 60 international organisations. The experience of INSPIRE in building interoperability across diverse and multi-country, multilingual systems is very significant to the development of GEOSS, and for this reason the JRC co-chairs the Infrastructure Implementation Board and the Data Management Task Force of GEOSS.

⁽¹⁰⁸⁾ <http://ggim.un.org>.

⁽¹⁰⁹⁾ <http://earthobservations.org>.

7 Results of the assessment

7.1 Synthesis of the state of implementation

The state of implementation of INSPIRE at this mid-term stage presented in Chapter 4 of this report shows that INSPIRE is being implemented across the EU (and some non-EU countries that are beyond the scope of this report) with some delay, and non-uniformity, but so far in line with expected costs and benefits. Although it must be recognised that major investments (and benefits) have yet to materialise, it must be equally acknowledged that the implementation has taken place in the most difficult financial circumstances that many European countries, and their public sector organisations, have faced for many decades. Notwithstanding these financial constraints, INSPIRE is starting to achieve its objectives, which according to 92 % of respondents in the 2014 public consultation are as pertinent as ever. Moreover, as indicated in Chapters 5 and 6, INSPIRE is increasingly recognised as a foundation framework for integrating on a spatial basis and making more effective and efficient a range of policies affecting the environment. The strong connection established between the flagship Copernicus programme and INSPIRE can be a very significant element in the implementation of the directive in coming years.

The following sections address the specific questions required by the Commission as part of the mid-term policy evaluation and the REFIT programme as indicated in Chapter 1.

7.2 Overall assessment

7.2.1 *Have the initial problems that INSPIRE intends to address evolved and in what way?*

The initial problems that led to the development of the INSPIRE Directive are stated in a generic form in Preamble (3) of the directive as '**problems regarding the availability, quality, organisation,**

accessibility and sharing of spatial data' (see also Section 4.1.1). This section evaluates if and how these problems have evolved since 2007 when the INSPIRE Directive was adopted, taking into account the impacts of the directive, and recent socio-technical developments.

The initial problem of the availability of spatial data in the context of INSPIRE means that data are not visible or accessible to users. This initial problem therefore partly overlaps with other issues such as spatial data accessibility and data sharing. The problem has evolved towards an increased availability of spatial data, partly as a result of INSPIRE documenting better what data exists, who is responsible and how to access it, and partly as a result of new socio-technical developments. The latter include at least three strands:

- the much increased volume of satellite imagery across the world; much of these data are available with no restrictions at least for medium resolutions;
- the success of citizen science and in particular citizen mapping like OpenStreetMap ⁽¹¹⁰⁾;
- the launch of many Open Government and Open Data initiatives worldwide leading to the G8 Open Data Charter at the 2013 Summit (see Section 6.1).

The initial problem of the quality of spatial data in the context of the INSPIRE Directive addresses the lack of documentation of data quality, as INSPIRE does not set quality criteria on the data, and does not require the collection of new data. From this perspective, the initial issue has evolved since the INSPIRE Directive was brought into force towards a more consistent description of spatial data sets, as discussed in Section 4.3.1.

The initial problem of the organisation of spatial data in the context of the INSPIRE Directive can be seen from three perspectives: internal to

⁽¹¹⁰⁾ <http://www.openstreetmap.org>.

public sector organisations, external with respect to structuring the community of data producers and users, and with respect to achieving the interoperability of spatial data sets, which is a technical but also organisational set of activities.

With respect to the internal aspects, the situation has evolved as a result of INSPIRE, as public authorities have become much more aware of the importance of their data assets and have started improving their documentation as well as organisation.

With respect to the external structuring issues of organising the community of producers and users, the situation has evolved towards a higher degree of coordination between producers, and increased dialogue with other stakeholders, to which INSPIRE has made an important contribution.

With respect to the interoperability of data sets across borders that are needed to support environmental policies, some progress has been made. Increased interoperability has been promoted at the European level by the ISA programme, including the European Interoperability Framework, while INSPIRE is starting to make an impact with the implementation of the provisions for the interoperability of spatial data sets and services (see Section 4.3.4). The further implementation of INSPIRE will address this issue more fully.

The initial problem of accessibility of spatial data includes multiple facets: finding the data, and overcoming issues of legal, organisational, financial and semantic nature as well as machine-to-machine communication. The initial problem of accessibility has evolved in a positive way due to technological developments that have made web services available across a wide range of platforms, including mobiles and tablets. Open Data initiatives have also helped to overcome some of the organisational and legal barriers to accessibility, while better descriptions of the semantic content and relationships (e.g. by RDF) are also contributing to increased accessibility. INSPIRE has also contributed on many levels, particularly with the specification of metadata (Section 4.3.1), and network services (Section 4.3.2), while interoperability at the data level is starting to make an impact only now (Section 4.3.4).

The initial problem of data sharing has evolved in a positive way as a result of numerous Open Data initiatives in Europe and several generic and overarching licensing frameworks, directly accessible on the web. INSPIRE has contributed towards the adoption of more Open Data policies, and also to the increased use of standardised

licences to share data between public authorities. Although there has been a positive evolution on all fronts, much remains to be done, as discussed below.

7.2.2 *Are the objectives of INSPIRE still relevant to the problem? Do they need to be reviewed?*

The general objective of the INSPIRE Directive is to have more and better spatial information available for policymaking and implementation at all levels of government — with a focus on environmental policies and policies that have an impact on the environment, including policy integration. Five specific objectives are set to remove the barriers identified to meeting the general objective:

- Documentation objective: More spatial data and services falling under the scope of INSPIRE should be documented according to harmonised standards.
- Services objective: More Internet-based (network) services should be established allowing discovery, view and download of spatial data, complemented with services allowing spatial data transformation to interoperable specifications and for invoking other spatial data services.
- Interoperability objective: Spatial data and services should be more interoperable and — where practicable — harmonised in order to facilitate the access and use of spatial data from different sources.
- Data and services policy objective: More arrangements should be in place allowing public authorities to gain access to spatial data and services, and to exchange and use them without restrictions likely to create practical obstacles.
- Coordination objective: More appropriate structures and mechanisms should be in place for coordinating, across the different levels of government, the contributions of all those with an interest in their infrastructures for spatial information.

The general policy objective of INSPIRE is still relevant to the initial problems. The increasing complexity and inter-connection of issues affecting the environmental, social and economic aspects of our society are generally recognised and influence the way new policies are prepared and implemented. Good policy relies more than ever on quality

information and informed public participation. The 6th EAP 2002–2012 already emphasised the need to base environmental policy on sound knowledge and participation. The 7th EAP 2013–2020 ⁽¹¹¹⁾ recognises progress made yet emphasises the fact that data collection and quality remain variable and that the multiplicity of sources can make access to data difficult. The Programme stresses the need for continuous investment to ensure that credible, comparable and quality-assured data and indicators are available and accessible to those involved in defining and implementing policy. It refers directly to INSPIRE and stresses the need to further develop EU-wide electronic data exchange with enough flexibility to encompass new areas.

The relevance of the general objective of INSPIRE is confirmed by the results of the public consultation where 92.5 % of the respondents to the public consultation consider INSPIRE as still relevant for resolving the problems it set out to address.

The specific objectives of INSPIRE are also still relevant to the initial issues. Even though all initial problems have evolved in a positive way, they are not yet resolved. In addition, obstacles still remain in achieving the general and specific objectives of INSPIRE, as indicated in Chapter 4:

- Incomplete, missing and non-compliant metadata remain a barrier to finding and accessing spatial data, as noted by 44 % of the respondents in the public consultation.
- Services are not yet sufficiently implemented in a consistent way across Europe, as documented in Section 4.3.2, and obstacles to data access and use remain.
- The majority of data sets under Annexes II or III are not yet available in an interoperable way as the specifications have only recently been adopted. As a result, 83 % of spatial data providers responding to the public consultation indicated that their spatial data still need to be aligned to the INSPIRE data specifications.

Data sharing policies are still considered an obstacle. This is confirmed by the respondents to the public consultation, which consider 53 % of spatial data still affected by conditions limiting their wider use. In addition, several countries confirmed in their reports

outstanding problems in this area, with the greatest barriers to use still arising from the heterogeneous rules on licences, prices and data protection.

Coordination across levels of administration and stakeholder participation has improved. Yet, the risk for duplicating efforts through poorly coordinated policy initiatives remains an obstacle. Raising awareness across all public authorities involved needs further efforts.

In view of the above, the general policy objective is still relevant to the problem, but could be reviewed to align better the infrastructure for spatial information established by INSPIRE with other Open Government and Open Data initiatives to achieve greater synergy across policies and increase effectiveness (see also Section 7.2.12). Furthermore, references to related environmental initiatives like the SEIS and SIIF ⁽¹¹²⁾ would be appropriate as they support the implementation of INSPIRE and its use for environmental reporting.

The five specific INSPIRE objectives are also still relevant to the problems they address, but two in particular could benefit from being reviewed:

- With regard to the Coordination objective, a review could be considered to take into account the perceived lack of internal coordination (from national to local level) as well as between neighbouring countries. This is confirmed by the public consultation where 55 % recognise the INSPIRE potential to improve access and use of spatial data across borders and only 20 % consider INSPIRE well-coordinated between neighbouring countries.
- With regard to the Data and services policy objective, a review seems necessary on the basis of the persistent barriers to sharing. This need is confirmed by the reports of several countries, the findings of the independent assessment, and the outcome of the public consultation where the user community considers that still 53 % of the spatial data are not covered by adequate data policy arrangements. Better integration with the revised PSI Directive (see Section 6.1) and the Directive on Public Access to Environmental Information ⁽¹¹³⁾, as well as with recent Open Government and Open Data initiatives would also be appropriate.

⁽¹¹¹⁾ <http://ec.europa.eu/environment/newprg>.

⁽¹¹²⁾ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52012DC0095>.

⁽¹¹³⁾ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:041:0026:0032:EN:PDF>.

7.2.3 *Are the actions of INSPIRE still appropriate or do they need to be modified?*

The key actions of INSPIRE to address the problems identified are the following:

- creating metadata (Documentation objective);
- establishing network services (Service objective);
- ensuring interoperability of spatial data sets and services (Interoperability objective);
- facilitating DSS (Data and services policy objective);
- establishing organisational structures and coordinating the implementation of INSPIRE (Coordination objective).

Chapter 4 reviewed the state of progress in each of these actions, or components of INSPIRE. Each component is assessed below with respect to its current appropriateness. For the purpose of this mid-term evaluation, a measure is appropriate if it has the expected impact and therefore is still effective in reaching its objective, and there are no alternatives that are more effective and more efficient.

Creating metadata

Section 4.3.1 shows that there has been significant progress in the documentation of the resources falling under INSPIRE: On average, 77 % of Annex I, 66 % of Annex II and 39 % of Annex III data were documented with INSPIRE-compliant metadata in 2012. There are delays and major geographical variations across the EU, but progress has been made. Some minor modification to the Metadata Implementing Rules were proposed by the Commission at the INSPIRE Committee meeting of November 2012. The Committee decided to defer such issues to the process of maintenance of the directive after 2013. It has yet to be enhanced through research and operational experiences. The maintenance process that has been recently established (see Section 4.2.1) can also deal with any measure needed to support improved completeness, quality and geographical consistency in implementation of INSPIRE metadata. Therefore, any modification deemed necessary to improve coherence and consistency can be put forward and addressed at a later stage as part of this maintenance process.

Establishing network services

At this stage of the implementation, discovery and view services are the ones more developed. Section 4.3.2 indicates that there is progress: On average, 63 % of the metadata for the spatial data sets and services are available through discovery services, and 27 % of the spatial data sets are available through view and download services. There are delays in implementation and significant geographical variations both in the provision of the network services and in the links to the INSPIRE geo-portal.

The independent study ⁽¹¹⁴⁾ shows that there are some difficulties in implementation and in reconciling the data sets and services declared by the Member States with the ones found and accessed through national geoportals and the INSPIRE geo-portal. Related to the INSPIRE geo-portal, other search mechanisms could be evaluated (e.g. popular search engines) that complement it and might improve the visibility of INSPIRE data on the Internet. These difficulties are confirmed by the results of the public consultation.

Notwithstanding these issues, the combination of metadata and discovery/view services is a central achievement of INSPIRE to date in addressing the problems identified in the previous sections. This proves the effectiveness of the actions related to network services, while no more efficient alternative can be identified. This is confirmed by the results of the public consultation. No modification related to network services seems necessary at the moment but improvements can still be put forward and addressed at a later stage as part of this maintenance process.

Since the adoption of INSPIRE, the Service-Oriented Architecture (SOA) on which INSPIRE is based has been complemented by other architectures (e.g. Resource-Oriented) and technologies (e.g. Linked Data) that often underpin data infrastructures in the eGovernment domain. Whilst measures to bridge across these architectures and technologies are helpful to better integrate spatial and non-spatial data, no need can be identified in this regard to review the actions related to INSPIRE network services as such.

Enabling interoperability of spatial data sets and services

The measures defined by INSPIRE to achieve the interoperability of spatial data sets and services are

⁽¹¹⁴⁾ http://inspire.ec.europa.eu/reports/INSPIRE_Direct_Observations_2014.pdf.

without a doubt the core of INSPIRE, and one that sets it apart from other similar SDIs in the world. As indicated in Chapter 4, most of these measures have yet to be implemented, and those related to Annex I data sets that are 'newly collected or heavily restructured' are progressing with some delay and significant geographical variation. Evidence from the public consultation also indicates that this part of INSPIRE is technically complex, which is perceived by about 20 % of respondents as an obstacle to implementation and use.

There is little doubt that the measures put in place by INSPIRE are complex, but no alternative could be identified in order to achieve the interoperability objective. Whilst the actions related to interoperability are appropriate, further modifications might be taken into consideration in order to enable further benefits. The high complexity of this field of action is additionally identified as an issue by the ongoing maintenance process (INSPIRE MIF). Possible modifications — as suggested by the public consultation — are improved communication and secondly reflections about possible reduction of the technical complexity. One area where additional measures may be needed is to ensure that the Member States deposit and share the data models (including underlying use cases) they are detailing for individual applications. In this way they can be reused across Europe, ensuring that the interoperability achieved at the general level is not lost at the detailed one. Furthermore, European funding could represent powerful levers to ensure cross-border data interoperability, which implies that this topic is included in the funding programmes of the European Commission.

Data and service sharing

This set of measures is another crucial component of INSPIRE as the majority of barriers to accessing data are not technological but due to policy, organisational, legal and cultural barriers. As introduced in Section 6.1 and Section 7.2.1, there has been some progress in recent years through the adoption of Open Data principles and policies, and the greater use of standardised licences (e.g. Creative Commons) or generic and overarching framework agreements. Nevertheless, as discussed in Section 4.3.5, there is still much to be done to overcome existing obstacles. With respect to data sharing among public administrations, only in around two thirds of the countries have general measures to support data sharing in the spirit of the INSPIRE Directive been put in place. There is also evidence that there are major differences across countries with often the need to set up bilateral

negotiations to access and use the data, which INSPIRE should have addressed.

The available information, on the degree to which arrangements have been made for sharing data with Community institutions and bodies, is often incomplete, although most of the time national legislations make no difference between them and national public authorities. Evidence from selected projects (GISC, Copernicus Land Monitoring Service) indicates a big difference across countries in access to data by Community institutions and bodies.

The actions envisaged by INSPIRE are therefore only partly effective and modifications might be needed, including more stringent guidelines for reporting by the Member States at large to report lack of compliance with the DSS provisions. At the same time, measures to support clear understanding of the conditions to access, sharing and use of spatial data sets and services by public administrations and users of the infrastructures can be addressed through the INSPIRE MIF.

Monitoring and reporting

These sets of measures — which support the Coordination objective — are effective and necessary to assess progress in the implementation of the infrastructure, and to assess costs and benefits. At the moment, there is no indication that these measures should be fundamentally revised but smaller modifications (e.g. better alignment with the EU policy evaluation framework) might be taken into consideration. Some suggestions have been made to improve the process with some more automated indicators and guidelines to ensure better comparability of the information provided across countries, and also over time to measure progress. These improvements can be addressed through the INSPIRE MIF, which has taken up this issue partly and further results and recommendations in this regard are expected.

Organisational structures and coordination of INSPIRE

Coordination is needed not just to ensure implementation of the measures envisaged but also to promote the concepts, raise awareness, build capacity and contribute to changes in organisational cultures, as are related activities without which barriers to access and use persist. The evidence in Section 4.2 indicates the participative model that has been put in place at European and national levels is by and large very good, and a distinctive feature of INSPIRE.

There are, however, significant variations across the Member States. The slow progress in implementation of the directive is often due to insufficient coordinating mechanisms at the national and cross-border levels, as indicated in Tables 4.11 and 4.12 in Section 4.5. In most countries, there is also a need to strengthen coordination with the local level, which so far has been insufficiently represented in the INSPIRE process for many reasons, including fragmentation, lack of capacity and resources. The actions taken related to the coordination are appropriate but modification might be taken into consideration, especially with the view on the upcoming challenges in the implementation:

- At the European level there is a need to strengthen the integration of INSPIRE into environmental policies and policies that affect the environment, as well as strengthening links with the reporting data flows from the Member States to the Commission.
- At the national level, there is a need to strengthen the involvement of the sub-national and local levels into the INSPIRE process and to build capacity, as well as increase communication, education and training measures necessary to implement INSPIRE among local administrations, and exploit fully the investment made in interoperability across Europe.
- The cross-border coordination between countries needs to be strengthened in order to enable effective and efficient data sharing on an international level.

7.2.4 Are changes (positive and negative) from the initial situation attributable to the implementation of INSPIRE?

Section 7.2.1 assessed the evolution of the problems addressed by INSPIRE, considering both the impact of the directive to date and the underlying socio-technical developments that have taken place since 2007. As shown, there has been a positive evolution in all the areas addressed by the directive, and in all cases INSPIRE has made a contribution to a greater or lesser extent. Most progress has taken place on the documentation of spatial data sets and services, and their discovery and view. Lesser progress has taken place with respect to download and transformation services, and interoperability of spatial data sets and services. This is to be expected as the implementing rules for these components of INSPIRE have been adopted at a later date, and particularly for the interoperability aspects there are still several years foreseen for implementation. The

data sharing aspects among public administrations should have been in place since 2009, but the only partial progress made to date has been duly noted as an area that requires further intervention.

7.2.5 Are results achieved so far commensurate with the means put forward and in line with the ones expected from the ex ante evaluation of INSPIRE?

To address these questions it is important to remember that we are only half way in the implementation of INSPIRE, and that most of the costs (and expected benefits) from the interoperability of spatial data sets and services have yet to be incurred. In fact, the technical specifications for the interoperability of spatial data sets for Annexes II and III and for spatial data services have only been adopted in 2014. Therefore, we can only refer to the costs and benefits incurred so far (in fact up to 2012) for the creation of metadata, the setting up of network services for discovery, view and download, and for the initial work on the interoperability of Annex I data.

Section 4.5 indicates that the costs incurred by the Member States so far are generally in line with what was estimated at the time of the Extended Impact Assessment (XIA). Greater costs were incurred in some instances to provide effective coordination and consultation mechanisms in light of the complexity of the technical specifications of INSPIRE. However, these higher costs seem to have been counterbalanced by smaller costs for the setting up of services, with some notable use of open source software and shared development/customisation costs among some Member States. The costs for data harmonisation are also generally in line with what was foreseen with some notable higher initial costs in setting up the environment for schema transformation and for understanding the complex data models. After that, costs decrease. The evidence from the studies undertaken by the Commission as well as that provided by the Member States in their three-yearly reports supports these findings. It remains to be seen, however, how Member States will organise the harmonisation of data held by local-level organisations, which are often responsible for Annex III data sets.

The benefits of INSPIRE are also so far in line with what was foreseen. Inevitably such benefits are at the moment confined to better data documentation, greater discoverability and availability of spatial data, which is supported by the results of the public consultation mentioned earlier. The survey of

practitioners undertaking Environmental Impact Assessments (EIAs) and Strategic Environmental Assessments (SEAs) reported in Section 4.5 indicates that the benefits coming from this improved availability are consistent with what was estimated in 2003, and sufficient through this application alone, to balance most of the costs of implementing INSPIRE. The evidence from the Member States' reports and from the 2014 public consultation shows also benefits internal to public sector organisations with respect to improved data management, as well as wider benefits through improved public sector coordination at national and sub-national levels. Benefits not yet fully realised appear to be in the area of data and service sharing, but we also lack evidence of the number of organisations that have tried and failed to obtain access to data on the basis of the INSPIRE provisions, and the costs thus incurred that could have been saved had the full provisions of INSPIRE been applied. This is an area that needs further monitoring, as indicated in Section 7.2.3.

In summary, the results achieved so far are commensurate with the resources deployed and in line with previous estimates. Continued monitoring is required in the coming years to assess the full investments needed to implement INSPIRE and exploit the opportunities to derive maximum benefits.

7.2.6 *Is the geographical coverage of implementation consistent?*

This question addresses the extent to which the INSPIRE Directive is implemented in a consistent way across the whole EU. The evidence presented in Chapter 4 shows that this is clearly not the case for any of the measures introduced by INSPIRE, due to different reasons.

With respect to the transposition of the directive into national law, Section 4.1 showed that the domestic laws are not yet conforming uniformly to INSPIRE in a number of countries. The conformity assessments even point to important differences within Member States where INSPIRE needed to be transposed in regional laws. As indicated, 14 EU Pilots⁽¹¹⁵⁾ had to be initiated in 2013 due to missing or incorrect measures being transposed into domestic law (out of 27). Since then, most issues seem to have been addressed on a formal point of view although the results of the public consultation, the independent assessment study and the Member States' reports provide indications that

some INSPIRE measures may have been incorrectly and/or badly applied.

With respect to the measures relating to metadata, network services, connection to the INSPIRE geo-portal and interoperability of spatial data sets and services, the relevant sections in Chapter 4 also point to significant variations across the EU. Six Member States had even failed to communicate the endpoints of their discovery service to connect to the INSPIRE geo-portal, even if in some instances they have several data sets and services documented. Unfortunately, the work done to make them documented and discoverable could not be harnessed at the European level because of this delay.

Similar pictures apply also to coordination and data sharing measures, where again the evidence in Chapter 4 points to significant variations across the EU that reduces the overall impact of the directive. Different models of coordination structure and different national approaches lead to heterogeneous approaches on how to implement the actions set out by INSPIRE. The upcoming change in the implementation priorities from Annex I to Annexes II and III might even increase these already existing regional inconsistencies.

This inconsistent picture is the result of many factors, including differences in institutional capacity, and the impact of the financial crisis in Europe since 2009, which had a significant impact on the resources available in public administrations. The evidence from Chapter 4 nevertheless also shows that a process has been put in place that is delivering benefits and organisational change. This process will obviously take time to complete but shows a positive trend. In the light of these considerations, there is a need to reflect on how best to support the implementation process across the many countries that are lagging behind.

7.2.7 *What kind of administrative burden and costs for public authorities and other public users (enterprises, including SMEs, private citizens, etc.) have been identified?*

Administrative burdens and costs to implement INSPIRE fall primarily on public administrations. The term burden refers to task loads that have become a major challenge for the stakeholders in terms of capacities and resources. The burdens in

⁽¹¹⁵⁾ http://ec.europa.eu/eu_law/eulaw/pdf/com_2007_502_en.pdf.

general depend on the individual situation of the stakeholder, and the perception of burdens can be different from country to country and from institution to institution. General challenges for the implementation of INSPIRE are the lack of capacity related to the technical complexity, the lack of awareness of decision-makers and the lack of financial resources for the implementation of INSPIRE. This is confirmed by the results of the 2014 public consultation, which list technical complexity issues as well as the lack of coordination, communication and awareness at senior-level as obstacles to implementation (Table 4.11, Section 4.5).

Citizens and the private sector have not been burdened by INSPIRE. On the contrary, they benefit from greater ability to find and access spatial data, and from a general greater openness of data policies in the public sector, which is partly a contribution of INSPIRE. For SMEs, the SMEspire project (see Section 4.5) showed that there are many business opportunities available coming from INSPIRE, helping public administrations in its implementation, and/or exploiting the new data and services available.

7.2.8 How can burdens and costs related to the users best be minimised or eliminated?

The main burdens for users identified in the previous question are technical complexity, and the lack of coordination, communication and awareness.

As mentioned earlier, the technical complexity cannot be reduced to any great extent as harmonising data content at the semantic level across so many themes and disciplines is a major undertaking. Sharing of experience, solutions and tools can however help address this complexity and make it less burdensome. This is the topmost requested action by both users and producers in the public consultation (see Table 4.12, Section 4.5). The perception of the technical complexity is also related to individual capacities and awareness. Here, measures for capacity building and a better coordination between stakeholders are needed. The education and training of staff in the fields relevant to and needed for INSPIRE can help public authorities as well as the private sector to work more efficiently in their roles as data provider and user. Training depends on and responds to the individual situation and can be provided on different levels, the national level via the coordinating structures or on the institutional level. The situation regarding specific capacities can also be improved by a better organisation and collaboration between countries

and institutions. As pointed out in Section 4.2.2, there are different approaches towards the cooperation between stakeholders. Capacity that is available in one institution can be shared to a certain extent and not every institution has to necessarily develop or maintain the full set of capacity related to INSPIRE. Improvement and further development of the existing cooperation between stakeholders offer a range of opportunities, especially for institutions that don't yet have the needed capacity.

Increased efforts in capacity building already impact the awareness on certain levels. Further awareness raising, especially with regard to communicating INSPIRE and its objectives, is needed in order to increase commitment and responsibility also on the political level. As described in Section 4.2.2, a strategy for the implementation of a wider eGovernment or spatial data framework was developed in some countries. This process created a common understanding and awareness for the objectives, measures and expected benefits. Furthermore, it is stated in Section 4.2.2 that the existence of such a strategy is in correlation with the progress of the implementation and the satisfaction of stakeholders in the respective countries. However, INSPIRE user uptake could be facilitated by improved communication to penetrate the technical complexity and by developing added-value services for extracting data relevant for users.

7.2.9 What would be the estimated value of saved administrative costs for public authorities and other public users?

The evidence presented by the Member States in their 2013 reports indicates benefits of implementing INSPIRE only in qualitative terms, so it is difficult to estimate the value of saved administrative costs. Some of the statements reported in Section 4.5.4 show that benefits are accruing in many countries. For example, France reported that 'The prime beneficiaries are the staff of the public authorities themselves ... The gains result from the following factors: faster discovery of the data, easier use of the data, limitation of the restrictions and reduction of the cost barriers thanks to mastering new tools and rising competence on environmental themes', while Sweden indicated that 'The envisaged benefits of the infrastructure have indeed been realised. The spatial data cooperation has paid dividends both internally and externally, and there are also examples of increased benefits for third parties. Access to a greater volume of spatial data via the spatial data cooperation has opened the eyes of certain organisations to new possibilities and

areas of application and is also contributing to better and more reliable decisions'. The benefits are therefore wider than just saved administrative costs, but include also reduction in other costs, and opportunities for better integration, new applications and more reliable decisions.

One of the few quantitative estimates of the value of saved costs for public administrations can be derived from the Study on the Use of Spatial Data for the Preparation of Environmental Reports ⁽¹¹⁶⁾ in Europe reported in Section 4.5.2, which indicated a saving of 15 % in time and costs of finding, accessing and integrating the thematic spatial data necessary to undertake EIAs and SEAs in Europe. This saving was worth some EUR 150 million per year for both developers and public administrations commissioning these studies.

7.2.10 Which gaps or inconsistency in the measures and working methods of INSPIRE have been identified?

The participative working methods of INSPIRE throughout its development and in this first part of implementation have been a model of good practice for many countries inside and outside Europe. Still, especially in the environmental domain and where implementation considers regional and local levels of governance, there are gaps related to a general lack of awareness, participation and capacity-building activities. There is also a lack in senior-level commitment in some Member States, as the 2014 public consultation indicates.

The gap between the expected acceptance and the actual perception of stakeholders is based on the differences between the rather technical community working on matters of infrastructure and the individual thematic communities related to the several topics INSPIRE is addressing. Until now there is a distance between these communities, which leads to different perceptions of INSPIRE, its measures and expected benefits. This distance can be overcome by providing systematically and in a targeted manner timely support to policy areas in the coming years, as is the general policy objective of INSPIRE.

From a technological perspective, we need to acknowledge that technology evolves at a higher

rate and asynchronous from legal obligations and the procedures to establish them. This leads to potential gaps between technology and the specifications of INSPIRE, especially on the level of the technical guidelines. The strategy in INSPIRE to make a clear separation between the legally binding implementing rules and the optional technical guidance documents has proven effective in adapting to technological change. As a result, the implementing rules can be considered to be relatively stable, while the technical guidance can be more responsive to technological evolution. Additional measures are also being introduced to bridge the Service-Oriented Architecture framework of INSPIRE with the Resource-Oriented Architectures. Additionally, Linked Data is becoming more popular in the area of eGovernment. This will enable a closer synergy between public sector spatial and non-spatial data to the benefit of all users and stakeholders.

There is inconsistency in the interpretation and usage of the INSPIRE terms 'compliance' and 'conformity'. This is reflected in an ongoing discussion among the Member States taking place in the MIG. It is important to clearly define these terms and to specify precisely under which conditions a provider can claim their data and/or services to be compliant/conformant. Furthermore, compliance/conformity tests should be automated as much as possible in order to support data/service providers.

Another area showing inconsistencies relates to data and service sharing and the measures taken so far for coherent implementation. Technical, financial and organisational obstacles have been identified in both the Member States' reports and in the public consultation. This is partially due to the fact that data sharing arrangements are rather weakly or too broadly specified and that there is a large range of existing data sharing and licensing arrangements in place that have not changed much so far.

7.2.11 How can the INSPIRE Directive and implementing rules be modernised and made less bureaucratic for the users?

The public consultation identified three main obstacles in the implementation of INSPIRE: technical complexity, coordination and communication (including capacity building), and

⁽¹¹⁶⁾ http://ies.jrc.ec.europa.eu/uploads/SDI/publications/JRC_technical%20report_2009%20EIA-SEA%20survey.pdf.

data harmonisation, which many respondents find too wide in scope, with multiple ways to implement the requirements. Also, data sharing issues and licensing scores high on the list of obstacles to the use of INSPIRE, which is further confirmed by reports from the Member States.

INSPIRE may be technically more complex than other directives, but the hundreds of experts who have contributed to the drafting of the implementing rules and the related technical guidelines documents by and large agreed that such complexity is needed in order to achieve to the full the vision expressed in the recitals of the INSPIRE Directive. Member States, through their role in the regulatory process, have confirmed this. While the technical complexity is needed for effective interoperability, the communication strategy must be improved and possibilities for simplification should be evaluated. Moreover, sharing of experiences and best practices, methods and tools is identified in the public consultation as the most important action needed to achieve the objectives of INSPIRE (Table 4.12, Section 4.5). This is a practical way to help address the issues of simplification of the technical specifications. This, however, can be addressed at the level of maintenance and does not necessarily need a modification of the legal text.

In Chapter 4, the National Mapping and Cadastre Agencies are mentioned as initial key partners in the process of the development and implementation of INSPIRE, with environmental ministries and agencies contributing to a lesser extent, at least in the initial stages. This points to the need to strengthen the user base in INSPIRE, both at national and EU levels. In the coming years, alongside the implementation of the recently adopted implementing rules' legal acts, Member States, the European Commission and the EEA must collectively develop further the integration of INSPIRE with thematic environmental legislation. For instance, it is crucial to develop a clear connection between EU reporting obligations and INSPIRE so as to reduce overall administrative burden and make reporting easier and more efficient for the Member States. This increased integration means not having to do the same operation many times for different directives or international obligations, thus saving time, increasing coherence and reducing overall bureaucracy.

Equally, the Member States need to start using INSPIRE to support their implementation of environmental policy and policies that affect the environment. The evidence from the Member States'

reports is that the focus is almost exclusively on implementing the infrastructure rather than starting to use it for the purposes for which it was designed. More attention needs to be paid collectively to this critical issue, which will produce the synergies necessary to reduce overall administrative burden, and hence bureaucracy. This communication action and the related building of capacities to actually use the services provided by INSPIRE is needed and will result in increased acceptance and understanding of the technical complexity.

While doing this, measures should be adopted to address the main obstacles to the users of INSPIRE. In particular, the multitudes of licences that protect the data and services have been mentioned as a 'bureaucratic overload' and that situation needs to be improved. To address this important issue, it would be desirable to develop a single-click licence similar to Creative Commons that applies to all public administrations in Europe to access and use all the INSPIRE-related data sets and services for environmental purposes. Alternatively, the increased use of harmonised licences or modular licence frameworks would contribute to the less bureaucratic access to INSPIRE data sets and services.

7.2.12 What could make INSPIRE give even more value for money to the users?

Aside from additional benefits, yet to be fully measured and coming from the interoperability of spatial data sets and services, there are several areas where greater benefits could be extracted: more efficient data sharing, use of the INSPIRE framework for other policies, spin-offs for SMEs, integration with Copernicus data.

With respect to reuse of data and data sharing, if more environmental and spatial data throughout Europe were available as Open Data or with comparable and directly accessible licence conditions, supporting machine licence interpretation, as discussed in the previous section, this would be a major advantage to all users, as confirmed by the public consultation and several Member State reports.

With respect to improved policy integration, some work has already started to extend INSPIRE to other policy areas such as the Intelligent Transport System but a measure of the untapped potential is the link between INSPIRE and the RINF required for railway companies, which is discussed in

Section 6.4. As discussed in Section 6.5, ways to increase the value for money include the following:

- Improved alignment with INSPIRE in thematic policies that are relatively mature in their use of location information. These include policies related to transport, environment, marine, agriculture, consumer protection and health, and energy, as well as cross-cutting policies on eGovernment and Open Data.
- Development of guidelines on how to refer to INSPIRE, location information and location-based services and geospatial standards in line with existing guidelines for the procurement of standards-based ICT.
- At the Member State level, a successful approach for improving alignment between policies is the establishment of base registers or key registers and the compulsory use of these registers by public authorities. The contribution of registers to the alignment of policies is especially important in case they are part of a broader set of key registers in eGovernment.

With respect to the alignment of INSPIRE with eGovernment and Open Data initiatives, the analysis in Section 6.1 points to a number of possible actions that include:

- bringing the INSPIRE Directive in line with the revised PSI Directive;
- introducing a clearer demarcation between the public task of government and its commercial activities;
- promoting communication and coordination at national levels between experts involved in INSPIRE and in the PSI working groups;
- assisting Member States in linking INSPIRE geo-portals to their national open data portals.

With respect to the potential spin-offs for SMEs, the evidence from the SMEspire project reported in Section 4.2.6 indicates that for exploitation of the growing opportunities further improvement of the access to data is still needed, both in respect to policy and to availability of download services. In general, access to data without restrictions provides, in the view of SMEs, the biggest opportunities to create innovative products and services. The technical complexity of the INSPIRE specifications may act as a barrier because of limited availability of the necessary skills, but provides also an opportunity

for those who have developed such skills as well as the SMEs that have invested in this area. It furthermore increases the potential to extend a successful prototype from one geographical area towards European coverage as the data will be more interoperable through INSPIRE.

A new area of necessary synergy that can leverage added value for both policy and industry in Europe is the integration of the vast quantities of data coming from the Copernicus programme, described in Chapter 6, from 2014–2015 onwards with the *in situ* data provided by INSPIRE. It must be leveraged also from an INSPIRE perspective to ensure that the investment made in Europe in both initiatives is fully complementary and delivers not only better policy but also innovation, and contributes to economic growth. Similarly, as the Galileo programme is implemented it is important that the dependencies with INSPIRE are properly addressed in the course of the INSPIRE MIF.

7.2.13 What is the EU added value of INSPIRE in comparison to Member States' activities?

First and foremost, the added value of INSPIRE is that it ensures that the infrastructures for spatial information created by the Member States are compatible and usable in a Community and trans-boundary context (cf. INSPIRE Directive, Recital 5). Excellent examples of cross-border sharing and reuse of spatial data have already been reported (see Table 4.7, Section 4.4). The interoperability of these infrastructures is not only important for environmental policy, or policies that affect the environment, but also to develop the single European digital market, which is one of the main areas of focus for the Digital Agenda, and Europe 2020. INSPIRE also aims at simplified and interoperable data sharing arrangements across the whole EU, which when implemented will support further environmental policy at all levels, as well as release untapped potential from the use of the data by the private sector. Without a measure of obligation, this policy harmonisation would not take place.

The creation of a community around INSPIRE has been enormously important. Starting with the participatory approach to stakeholder engagement in the development phase, it has helped to build capacity and share best practices, which in turn is helping organisations in the Member States to implement INSPIRE. This is not only important for INSPIRE but also for the contribution this has in spreading good practice across all public

administrations in Europe, increasing their efficiency and effectiveness, which are prerequisites for innovation and growth. Section 4.5 gives examples of such benefits, as reported by the Member States. Furthermore, European experience inspires some states in other continents and its expertise is exported to international organisations in charge of standards.

The INSPIRE roadmap for implementation spans until 2020 and it is therefore natural that there are still gaps in implementation, in particular

for obligations for which deadlines have not yet passed. From the public consultation and the direct observations it is also evident that some aspects of the INSPIRE Directive — notably the coordination at national and cross-border levels, and the removal of obstacles to data sharing at the point of use — would increase the EU added value if better addressed. Follow-up actions are recommended in these areas, as detailed in the previous sections.

Acronyms

AAA	Authentication, Authorization, Accounting
AQ	Air Quality
Art.	Article
ATM	Air Traffic Management
ATS	Abstract Test Suite
CDDA	Common Database on Designated Areas
CEN	European Committee for Standardisation
CENELEC	European Committee for Electrotechnical Standardisation
CISE	Common Information Sharing Environment
COGI	Commission inter-services group on Geographic Information
CORINE	Coordination of information on the environment programme
INSPIRE CT	INSPIRE Coordination Team
DAE	Digital Agenda for Europe
DG	Directorate-General
DG DEVCO	Directorate-General for Development and Cooperation— EuropeAid
DG DIGIT	Directorate-General for Informatics
DG ENTR	Directorate-General for Enterprise and Industry
DG ENV	Directorate-General for the Environment
DG RTD	Directorate-General for Research and Innovation
DSS	Data and service sharing
DT	Drafting Team
EAP	Environment Action Programme
EC	European Commission
EEA	European Environment Agency

EFTA	European Free Trade Association
EGNOS	European Geostationary Navigation Overlay Service
EIAs	Environmental Impact Assessments
EIONET	European Environment Information and Observation Network
ENP	European Neighbourhood Policy
ESS	European Statistical System
EPBD	Energy Performance of Buildings Directive
ESDI	European Spatial Data Infrastructure
EU	European Union
EULF	European Union Location Framework
EUR	Euro (Currency)
FTE	Full-Time Equivalent
GBP	British Pound
Geo-ICT	Geographical Information and Communication Technology
GEO	Group on Earth Observation
GEOSS	Global Earth Observation System of Systems
GI	Geographic Information
GIS	Geographic Information Systems
GISC	GMES In-Situ coordination
GMES	Global Monitoring for Environment and Security
GNSS	Global Navigation Satellite System
GSA	European GNSS Agency
ICT	Information and Communication Technology
IED	Industrial Emissions Directive
INSPIRE	Infrastructure for Spatial Information in Europe
IR	Implementing Rule
ISA	Interoperability Solutions for European Public Administrations
ISDSS	Interoperability of spatial data sets and services
ISO	International Standards Organization

Acronyms

ISO/TC211	International Standards Organization, Technical Committee 211 (Committee on Geographic information/Geomatics)
IT	Information Technology
ITS	Intelligent Transport Systems
IPR	Intellectual Property Right
JRC	Joint Research Centre (Directorate-General of the European Commission)
LMO	Legally Mandated Organisation
M&R	Monitoring and reporting
MACC	Monitoring atmospheric conditions & climate
MD	Metadata
MDI-DE	Marine Dateninfrastruktur Deutschland
MIF	Maintenance and Implementation Framework
MIG	Maintenance and Implementation Group
MS	Member States
MSFD	Marine Strategy Framework Directive
NCP	National Contact Point
NMCA	National Mapping and Cadastral Agency
NS	Network service
NSDI	National Spatial Data Infrastructure
NUTS	Nomenclature of territorial units for statistics
OASIS	Organization for the Advancement of Structured Information Standards
OGC	Open Geospatial Consortium
PSI	Public Sector Information
RDF	Resource Description Framework
REDIAM	Environmental Information Network of Andalusia
REFIT	European Commission's Regulatory Fitness and Performance programme
RINF	Register of Infrastructures
ROSATTE	Road Safety Attributes Exchange Infrastructure in Europe
SDI	Spatial Data Infrastructure

SDIC	Spatial Data Interest Community
SDO	Standards-Developing Organisation
SEA	Strategic Environmental Assessment
SEIS	Shared Environmental Information System
SES	Single European Sky
SESAR	Single European Sky ATM Research programme
SEWeb	Scotland's Environment Web
SIIF	Structured Implementation and Information Framework
SME	Small and Medium-sized Enterprise
SOA	Service-Oriented Architecture
TEU	Treaty on European Union
TFEU	Treaty on the Functioning of the European Union
TG	Technical Guideline
TN-ITS	Transport Network ITS Spatial Data Deployment Platform
TWG	Thematic Working Group
UIC	International Union of Railways
UML	Unified Modeling Language
UN-GGIM	United Nations initiative on Global Geospatial Information Management
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
W3C	World Wide Web Consortium (W3C)
WFD	Water Framework Directive
WFS	Web Feature Service
WMS	Web Mapping Service
WISE	Water Information System for Europe
XIA	Extended Impact Assessment

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